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NAME OF SUPERVISOR/NOM DU DIRECTEUR DE THÈSE DR. J.P. DAS

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CHILDREN'S COGNITIVE ABILITIES AND THEIR RELATION TO SOCIOECONOMIC STATUS AND SOME PERSONALITY CHARACTERISTICS

by

JAMES MANOS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

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J. MANOS

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Children's cognitive abilities and their relation to socioeconomic status and some personality characteristics" submitted by James Manos in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

.....

Supervisor

W. H. Schmidt

Rosemary Chambers

D. J. Wangler

Date Oct. 17, 75

External Examiner

ABSTRACT

The present study examined some relationships pertaining to socio-economic status and levels of cognitive ability among school children selected from a grade 4 population. The focus of the thesis centred around Jensen's hierarchical theory of two levels of cognitive abilities and his underlying assumption that both levels are innately predetermined. Some environmental variables were investigated in relation to intelligence and achievement tests.

A battery of tasks, consisting of measures of Jensen's Level I (rote memory) and Level II (abstract reasoning) abilities, was administered to all the participating students. Also included were tests measuring the subjects' sense of powerlessness and motivation for taking tests. Parents of each of the subjects were interviewed using the Index of Educational Environment questionnaire in order to assess the subjects' home environment. School environment was controlled for by selecting both low and high SES students from the same classrooms.

The test scores were subsequently analyzed for both the low and high SES groups so that the results would provide an indication of environmental influences within each group. Jensen's general points regarding SES performance differences tended to be confirmed; the low SES students were more handicapped in Level II tasks than in Level I when compared with the higher SES students. However, there was one exception, both the low and high

SES students produced similar results on the Figure Copying test.

Jensen's underlying assumption that Level II ability is predominantly a result of heredity was not supported. The results provided no confirmation that differences between the two groups on various measures of I.Q. and achievement were due to the level of abstract reasoning ability required. There was strong evidence to suggest a cultural bias in both the content and form of tests of intelligence and achievement, favouring middle class students.

When the three predictor variables, the Index of Educational Environment (I.E.E.), Socioeconomic Status (SES) and the Intellectual Achievement Responsibility test (I.A.R.) were combined to predict scores on I.Q. and achievement, there was a strong positive correlation in both groups. More than half of the variance accounted for was attributable to the I.E.E. The SES added substantially but the I.A.R. had a negligible effect.

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CHAPTER I

INTRODUCTION

The evidence that individual differences in intelligence are very strongly associated with genetic determinants is voluminous and convincing. The most generally acceptable statement in this regard is that, when one deals with group data, increasing degrees of familial relationship are accompanied by increasing intellectual similarity. To accept this general statement does not in any way deny the power of experiential factors to influence the levels of intellectual ability attained by individuals. Given the validity of the assumption that intelligent behavior is mediated primarily through the structure and biochemistry of the brain, one's genetic endowment may define at least the upper limit, broadly conceived, of one's possible intellectual attainment by determining the initial structure and biochemistry of the nervous system. It has become quite apparent that certain unfavorable combinations of environmental circumstances do serve to depress the kinds of functions which are associated with scores on intelligence tests and with performance in academic and social situations. While the evidence is less plentiful, and in some respects less convincing, there are also quite strong suggestions that favorable combinations of experiences, properly programmed with respect to timing, sequence, quantity, and quality, can serve to elevate the characteristic performance levels of individuals who, without such experience, would almost certainly have performed at significantly

lower levels. One may say with some confidence then, that intelligence develops within the individual as a function of structured experience interacting with genetic endowment.

The disproportionate representation of low I.Q. individuals in the lower socioeconomic strata of contemporary society is well documented. While it is still possible that such individuals represent only the lower end of the normally expected range of genetic variation, and perpetuate their social and intellectual status by selective mating, the weight of current scientific opinion is that certain constellations of variables characteristically associated with the circumstances of lower class living have more than a correlational relationship to continuing patterns of borderline and mildly retarded performance.

The urban lower class child, in particular, is in a potentially disastrous situation for cognitive and motivational development. Encountering few adults in his immediate environment who are adequate and effective models of middle class behavior, and perceiving little similarity between himself and his middle class teacher, the lower class child may tend to engage in modeling behavior to an extent which is insufficient for the acquiring of adequate rules of social and learning behavior. These rules and modes of learning are necessary for academic success.

Research has begun to show that culturally disadvantaged individuals (in terms of the culture represented in most standard tests of intelligence) frequently show evidence of considerably more efficient learning processes than would be predicted from their intelligence test scores. Such a

discrepancy between the results of the two kinds of measures is not shown with anything like equal frequency either among organically mentally retarded persons or among individuals from nondeprived environments. Thus, the development of intellective and learning skills cannot be viewed apart from the environmental milieu which fosters them.

In the current investigation, no attempt will be made to resolve the nature-nurture issue as it relates to the development of intelligence. However, there will be an attempt to delineate some of the common ground on which low and high socioeconomic status students are similar. More specifically in this investigation an attempt is made to show on which intellectual tasks and under what conditions do the children defined as low SES or culturally deprived perform on some cognitive abilities on a par with their middle SES or non-culturally deprived counterparts.

In other words, several cognitive tasks varying along a continuum from pure memory to abstract reasoning are examined in relationship to socioeconomic status and related environmental factors.

CHAPTER II

THEORETICAL CONSIDERATIONS AND RELATED LITERATURE

INTRODUCTION

Charles Spearman (1927) was first to propose a factorial conception of intelligence. By intercorrelating large samples of cognitive task performances, he found sufficient communality among tests to support the concept of a single basic mental function. This general factor (g) is supposed to enter into any cognitive task requiring the ability to receive stimuli and mentally manipulate or transform such input. Spearman regarded abilities over and above g as specific or s factors which were unique to certain tasks. In other words, performance on any cognitive task involves a universal or general factor (g) and, to a lesser extent, a specific factor (s).

Since Spearman's pioneer work, a number of formulations concerning the nature of intelligence have been advanced on the basis of correlational techniques (cf. Vernon, 1950; Cattell, 1963; Jensen, 1969).

VERNON'S HIERARCHIAL MODEL

Vernon (1969) notes that a characteristic feature of mental structure is hierarchy. A hierarchical or group factor model of intelligence admits

the existence of a general factor, g, and successively subdivides into more specialized types of ability. In varying degrees, g enters into any cognitive performance, depending on the complexity of the symbolic processes for solution. The general ability, being symbolic, contrasts with tasks demanding skills of a more enactive of ikonic kind. After the removal of the general factor, g, tests fall into two main categories - the verbal educational (v:ed) and the spatial-perceptual-practical (k:m). Since these factors are not general, but run through a limited number of tests, they are called major group factors. If enough tests are given, the genealogical tree furtber subdivides into minor groups and then Spearman's s factors. For Vernon, an ability or factor implies the existence of a group or category of performances which correlate highly with one another and are relatively distinct from other performances. Thus, an ability is a construct accounting for the objectively determined correlation between tests.

In reference to the major group factors, Vernon points out that although people who score well on verbal tests usually perform similarly on spatial tests, it is possible for individuals to differ appreciably in their performance in these two areas. Of central importance for the current study is Vernon's claim that abilities over and above g arise partly from heredity but mainly as a function of experience.

The North American position, referred to by Vernon (1950) as the 'neo-faculty theory', diverges somewhat from the British view. American factorists are less inclined to acknowledge the presence of a general factor. Following Thurstone (1947) and Guilford (1967), the tendency has been to reduce the mind

to a number of independent primary abilities. In reality neither approach serves to negate the other, and both are reasonable models for viewing the structure of mental abilities. The specificity theory does not disprove the existence of a general factor, and likewise, adherence to g involves the acKnowledgement of group factors. For large representative samples the hierarchical model appears more parsimonious, whereas with relatively homogeneous groups - university students, MA - matched children - whdre g is in effect partialled out, the specificity model would possibly have more explanatory merit.

CATTELL'S THEORY OF FLUID AND CRYSTALLIZED INTELLIGENCE

Cattell (1963) claims that the general ability factor now measured by intelligence tests can be reduced to two oblique second order factors which he calls fluid (gf) and crystallized (gc) intelligence. Crystallized ability loads more highly on those cognitive performances in which skilled judgment habits have become crystallized as a result of earlier learning. On the other hand, fluid general ability shows more in 'culture-fair' tests such as matrices which require adaptation to new situations. Fluid ability "is a capacity to perceive relations and educe correlates in Spearman's original sense" (p. 8).

The ability, gf, supposedly represents the influence of biological inheritance or constitutional equipment, whereas gc is the result of skills and concepts established through experience. Measures of gf show much

greater variance, the standard deviation of IQs being 25+ as contrasted with a sigma of 15 which is typical of verbal tests. Cattell's explanation is that cultural pressures produce greater uniformity in the latter.

Over a person's lifetime gf will be more constant since this general ability is biologically determined. In contract, gc, which hinges on cultural habits, will be more flexible. Up until biological maturity, individual differences in gf and gc will reflect mainly differences in cultural opportunity and interest. Subsequent discrepancies will reflect differences in age as the gap between gf and gc will tend to increase with experience and the time decay of gf. With increasing age, gf will show a more rapid decline.

Vernon (1970) concedes that Cattell's theory provides a sound model for conceptualizing mental development and deterioration. He believes that Cattell's second order oblique factors are psychologically more intelligible than g and group factors. However, Vernon notes that if one regards gf as g with a slight admixture of spatial ability and gc as g + v:ed factor, Cattell's scheme could be viewed as an hierarchical theory. Vernon does not regard the genotype or Cattell's gf as being measurable and argues that the major weakness of Cattell's theory is the claim that fluid ability tests are immune to cultural influences. According to Vernon, abstract reasoning skills of the type demanded by matrices would appear to be built up in the same manner as those involved in verbal reasoning.

JENSEN'S MODEL FOR UNDERSTANDING INTELLIGENCE

Extensive research on the intelligence and learning abilities of children called culturally disadvantaged, to discover the ways in which they differ typically from middle class children in their intellectual capacities, has led Jensen to the formulation of a theory of mental ability which can comprehend most of the phenomena revealed by these investigations (Jensen, 1961, 1963, 1968a, 1968b). His theoretical formulation has also served as a basis for predicting new phenomena concerning the relationship between intelligence, learning ability, and socioeconomic status.

Jensen (1969) has provoked much discussion and critical thinking on the nature-nurture issue. In his article in the winter issue of the Harvard Educational Review, 1969, he re-examines much of the existent literature that relates to the heredity - environment controversy and reaches the conclusion that the genetic component in the development of intelligence is much larger than was popularly accepted in North America. He tenders a heritability estimate of 0.80 for intelligence. In other words, Jensen places much less stress on the plasticity of intelligence as suggested by many psychologists and educators. Many British psychologists, notably Burt (1966, 1968), have also held this point of view.

Jensen (1969, 1970) presents a model of human abilities in which the effects of SES are taken into consideration. On the basis of results of direct learning tasks as well as the results of differential factor analyses on high and low SES on which he found different patterns, Jensen has proposed

a two dimensional model for understanding social class differences in performance on tests of learning ability and intelligence. The first dimension is the familiar dimension of cultural loading. The psychometric tests used by psychologists prior to a special class placement vary in the degree of cultural bias. However, the findings that low SES children do worse on the Raven's Progressive Matrices which require complex abstract reasoning ability than on the Stanford-Binet which has a variety of conceptual tasks (Higgins & Sivers, 1958; Sperrazzo & Wilkins, 1958 and 1959) and that low SES children performed better, relative to high SES children, on I.Q. test items which were judged to be cultural rather than non-cultural (McGurk, 1951), have led Jensen to postulate a second dimension that is necessary to more fully understanding these observations.

The second dimension that Jensen has added concerns the complexity of the learning task. Tasks and tests vary along a continuum ranging from a simple associative learning task (Level I) to conceptual learning and abstract problem solving (Level II). Thus a digit span test would be predominantly a level one task while a concept formation-problem solving test such as Raven's Matrices would be mainly a level two task.

Furthermore, the assumption is made the the dimension of degrees of complexity is hierarchical in nature. In other words, the simpler processes are thought of as being necessary but not sufficient for the development and use of the higher level functions. Therefore, a low degree of ability on Level I functioning also has associated with it a lowered Level II functioning. Thus it is possible that through the genetic distribution of individual

differences, a person may have good Level I ability but poor Level II ability. Consequently, these persons would have subnormal performance on standardized intelligence tests, yet would appear to be brighter than the tested I.Q. on some dimensions of intelligent behavior.

Jensen's two dimensional model is presented graphically in Figure 1.

The theory also postulates that Level I ability is about equally distributed in all SES groups. In short, there is little, if any, correlation between Level I ability and SES. Level II ability, however, is distributed quite differently as a function of SES, there being a positive correlation between Level II and SES. Figure 2 shows the hypothetical distributions of Levels I and II in lower class and middle class populations.

Rohwer (1969) administered the Peabody Picture Vocabulary Test (PPVT), Raven's Colored Progressive Matrices, and a paired-associates learning test to a total of 288 children drawn in equal numbers (N = 48 per group) from Kindergarten, first and third grades in two kinds of schools - ones serving a low SES Negro area and ones serving an upper-middle class White residential area. The results indicated that the Negro-White or low SES vs high SES difference is much smaller for the Level I (paired-associates) test than for either the PPVT or Raven, which are both Level II tests. Also, the SES groups diverge on Level II with increasing age, the Negro and White groups show an increasing difference with advancing school grade on the two Level II tests, especially on the Raven.

Guinagh (1969) tested low SES Negro (N = 105), low SES White (N = 84), and middle SES (N = 79) third-graders on Raven's Progressive Matrices and a

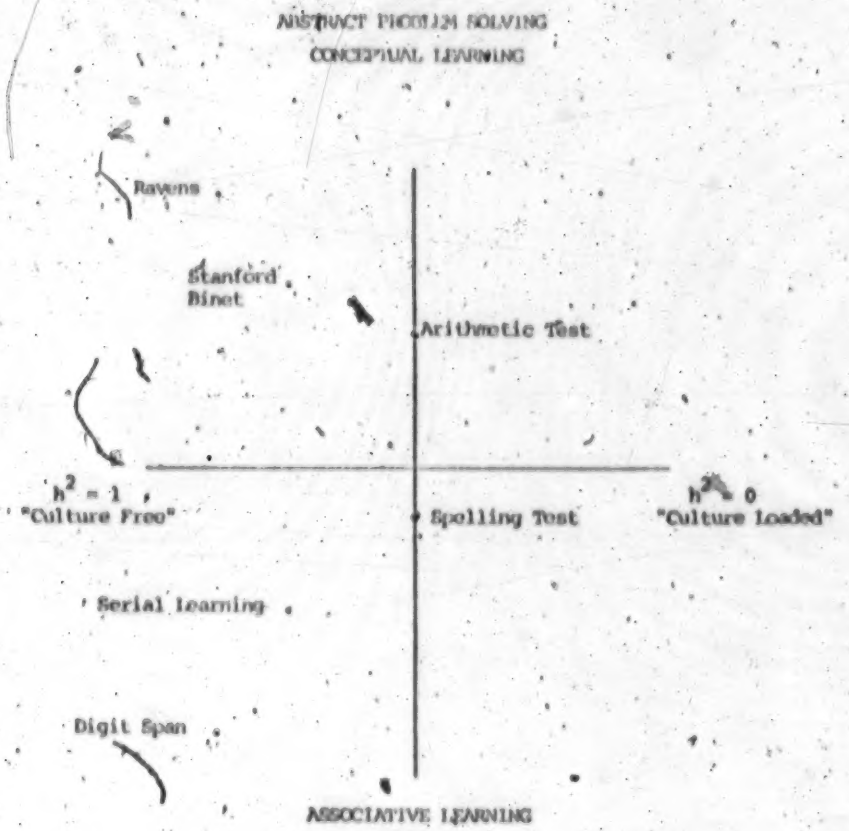

FIGURE 1

THE TWO-DIMENSIONAL SPACE REQUIRED FOR COMPREHENDING SOCIAL-CLASS DIFFERENCES IN PERFORMANCE ON TESTS OF INTELLIGENCE AND LEARNING ABILITY. THE LOCATIONS OF THE VARIOUS TESTS ARE SPECULATIVE.

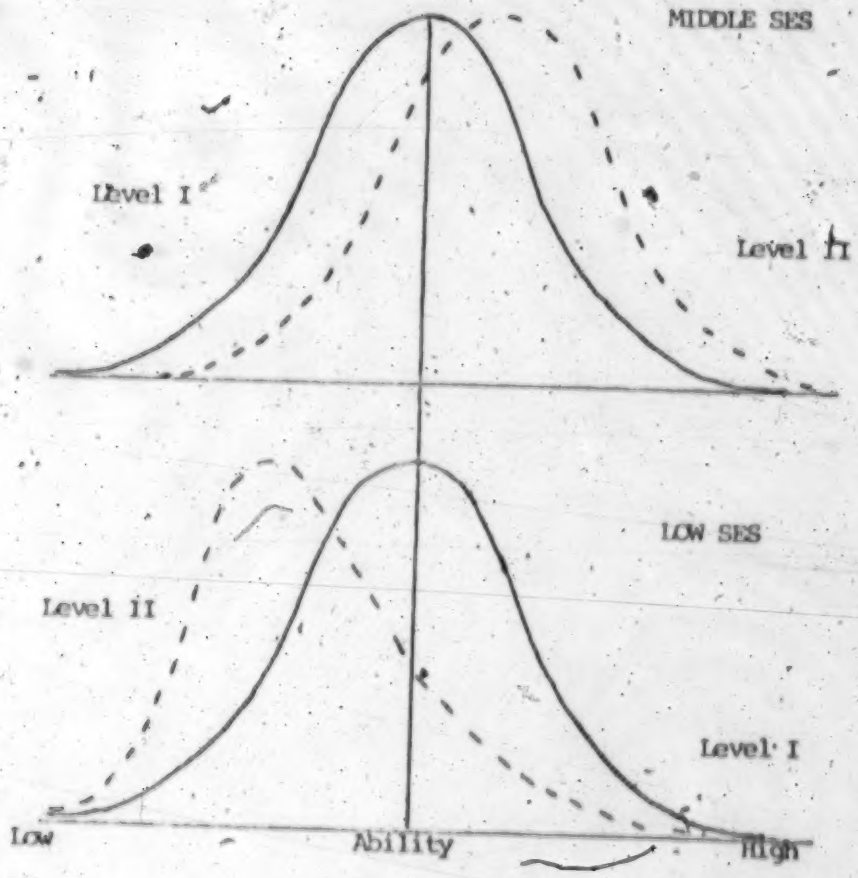

FIGURE 2

HYPOTHETICAL DISTRIBUTIONS OF LEVEL I (SOLID LINE) AND LEVEL II (DASHED LINE) ABILITIES IN MIDDLE-CLASS AND LOWER-CLASS POPULATION.

digit span tests. The low and middle groups, though differing very significantly on the Raven, did not differ significantly on digit span. Each group was selected from schools predominantly attended by that sub-population.

Jensen (1970) tested all 4th, 5th and 6th grade children in a partially integrated public school system with 50% White and 40% Negro pupil population on Level I and Level II tests (10% were Oriental and other ethnic minorities). The classification of groups into race differences was equated with low vs middle SES. The hypothesis that Level I and Level II tests are more highly correlated in the middle SES than in the lower SES population was confirmed. Level I ability was evenly distributed throughout both SES groups but the middle SES children had a significantly higher mean on Level II ability.

Why are these abilities said to have different distributions in lower and middle class segments of the population? Jensen (1970) argues that the educational and occupational requirements of our society tend to sort people out much more by their Level II ability than by their Level I ability, and it is occupational status that chiefly determines an individual's SES. Assuming largely genetic determination of individual differences in both Levels I and II, the "gene flow" would diffuse in both directions with respect to SES. If Level II is dependent upon Level I, then high SES children who are low on either Level I or II will tend as adults to gravitate to a lower SES level. If their deficiency is at Level I only, they will carry good genes for Level II with them in many cases; if their deficiency

is only at Level II, however, they will carry good genes for Level I with them as they gravitate to a lower SES. Moving from lower to higher SES on the other hand, carries with it good genes for both Level I and Level II. Jensen supports this set of conditions with two sets of observations. Kushlick (1966), in reviewing the research on SES and mental subnormality, notes that cultural-familial retardation, (I.Q. between 50 and 70), is predominantly concentrated in the lower social classes. On the basis of a number of surveys made largely in England, Kushlick concludes that mild subnormality in the absence of abnormal neurological signs is virtually confined to the lower social classes. He goes on to say that almost no children of higher social class parents have I.Q. scores less than 80, unless they have a pathological condition. In short, genes from low intelligence (meaning low Level I and/or low Level II, according to Jensen's theory) are largely eliminated from the upper SES segment of the population. Severe mental deficiency, due to brain damage and mutant gene and chromosomal defects, however, have about equal occurrence in all social strata. The second observation that Jensen used to support his formulation is the fact that it is not nearly as difficult to find gifted (I.Q.s above 130) children in the lower classes as it is to find retarded children in the upper classes. The Scottish National Survey established on a large scale that high intellectual ability is more widely distributed over different social environments than is low mental ability (Maxwell, 1953).

Jensen (1969) also makes reference to the nationwide Coleman Study

(1966) which included assessments of a dozen environmental variables and socioeconomic indices which are generally thought to be major sources of environmental influence in determining individual and group differences in scholastic achievement. These factors are all correlated with scholastic performance within each of the racial and ethnic groups studied by Coleman. Yet, these factors are not systematically correlated with differences between groups. For example, by far the most environmentally disadvantaged group in the Coleman study are the American Indians. But the American Indian ability and achievement test scores average about half a standard deviation higher than the scores for Negroes. The differences were in favor of the Indian children on each of the four tests used by Coleman: non-verbal intelligence, verbal intelligence, reading comprehension, and math achievement. Jensen states that:

> If the environmental factors assessed by Coleman are the major determinants of Negro-White differences that many social scientists have claimed they are, it is hard to see why such factors should act in reverse fashion in determining differences between Negro and Indians, especially in view of the fact that within each group the factors are significantly correlated in the expected direction with achievement. (p.49).

What Jensen has failed to mention is the fact that in the Coleman study, a much larger proportion of American Indians are integrated and are a part of the White school system than the Negro children. Coleman (1966) also found that the specific characteristics that showed the strongest relation to achievement were the educational backgrounds and educational aspirations of other students at the school. The educational backgrounds

and aspirations of fellow students appear to provide a facilitating or amplifying effect on the achievement of a student independent of his background.

Using the evidence of these studies, Jensen argues that the failure of recent compensatory education efforts to produce lasting effects on children's I.Q. and achievement tests suggests that the premises on which these efforts have been based should be re-examined. Jensen (1969) offers an alternative in that school subjects should be taught to low SES children in a form suitable for acquisition by means of associative learning (Level I) and to high SES children in a form amenable to conceptual learning processes (Level II).

A basic conclusion of Jensen's discussion of the influence of environment on I.Q. is that environment acts as a "threshold variable". Extreme environmental deprivation can keep the child from performing up to his genetic potential, but an enriched educational program cannot push the child above that potential.

ENVIRONMENTAL CONSIDERATIONS

The nature-nurture issue in intelligence has been discussed by psychologists and educators endlessly and is not the main purpose of this dissertation. The more important consideration is to what extent non-genetic factors can influence, if at all, the level of intelligence and achievement of both low and high SES groups. In other words, do we accept

Jensen's proposal that environmental effects in general have little bearing on a child's intellectual ability and thus concentrate our efforts on teaching the low SES child associative skills, or do we take into consideration various non-genetic effects on intelligence and attempt to create situations more conducive to development of abstraction and reasoning for deprived children.

In attempting to answer this question, the following quote by McClearn (1967) should be considered:

> The key concept of heritability explicitly and necessarily involves the simultaneous consideration of both genetic and environmental determinants. With this formulation, an attempt to describe a trait as being 'genetic' or 'environmental' in origin is seen to be meaningless. It is also important to know that the heritability estimate obtained from a particular set of operations is not an eternal, fixed value of the trait. Depending simultaneously upon environmental and genetic variance sources, the heritability will change as a given population is subjected to different environmental circumstances, or as its genetic composition changes. Thus a heritability value refers to a given trait in a given population at a given time in a given environment. (p. 103).

Those who consider the environment as an important variable in determining intelligence would argue that since it is impossible to specify what any person's future encounter with his environment will be, attempting to predict his future behavior from test performance is not sufficiently justified. Jensen himself (1969) illustrates this point quite clearly when he mentions that tuberculosis once had a high heritability but now has a low one. The change was due entirely to an environmental change (reduced exposure to infection). Yet Jensen believes that environmental modification

(i.e. reduced exposure to adverse learning conditions) cannot significantly modify the I.Q. of culturally deprived children because the I.Q. has high heritability.

Behavior becomes progressively more intelligent the more complex the "lines of interaction" between organism and environment become, or as Hebb (1949) would say - "The greater the amount of autonomous cerebral activity". Intellectual conceptions and reasoning do not develop in isolation, yet in trying to measure intelligence we are artificially abstracting intellectual competence from the context of sentiments and complexes in which it normally manifests itself. In particular, the child who is not exposed to any schooling builds up skills largely at the inactive level which are adequate for everyday living. But the longer he operates with these, the more difficult it is for him to acquire fresh concepts or move on to symbolic thought. In essence, he has learned to be unintelligent (Vernon, 1969).

From the 30's psychologists began more and more to question the findings of previous investigators who attributed the differences in the test performance of children selected from different racial and socioeconomic groups to the genetic factor. This was a logical sequence to the nature-nurture investigations which began to give a new slant to psychological thinking at the time with regard to the extent of the effect of environment on inherited capacity. In this regard the difficulty for assessing with any degree of reliability the extent of the influence of environmental factors on native or potential ability was stated by Freeman et al. (1928)

as follows: "When differences in heredity are associated, it is impossible to determine which is the cause and which is the effect".

The hazards in nature-nurture investigations were also pointed out by Burks and Kelly (1928) in the following comment:

> Selection is given first place among the hazards because it is so persistent, so wide spread, and often so hard to recognize. A practical definition of selection as used here would be the systematic operation of one or more factors that prevent a group of individuals from being what they are assumed to be. (p. 16).

The early studies carried out by Galton (1914), Terman et al (1925), and Hollingworth (1926) had placed all emphasis on the hereditary factor for superiority in mental achievement. It was held that genius ran through families but factors such as home environment and other cultural influences which contributed largely to the test performance of the gifted children studied were overlooked. Burt (1955) held the view that "The evidence indicates that at least 75% of the measurable variance is attributable to difference in genetic constitution and less than 25% to environmental conditions". But the general trend of opinion by most contemporary research workers, as will be noted later, is that it is difficult to assess the difference between acquired and innate mental abilities.

Vernon (1960) made one of the most forthright statements in which he crystallized the views of contemporary British and other psychologists on racial differences in mental ability as may be judged by pencil and paper tests: "Individual differences within racial or national groups are far larger than differences between groups". Then he went on to state: "At least 10% of

Negroes surpass the average American White, and 10% of Whites score lower than the average Negro. There is probably no reputable psychologist nowadays who would maintain that these results represent genuine innate racial differences". He pointed out further that several might state the exact opposite, adding that the superior groups are just those provided with the best economic and social conditions and the best education and went on to state that "The majority would be more likely to say that we cannot really make valid comparisons at all, since no tests can be devised which are 'culturally neutral' - that is, equally fair to groups with very different upbringings".

The remainder of this chapter will review the relevant literature pertaining to the influence of environmental or non-genetic factors on intelligence and achievement tests.

The practice and formal schooling factors

In connection with the effects of formal education and training on attainment of psychological test scores, Anastasi (1958) pointed out that "Psychologists have come a long way from the old idea that I.Q. is a property of the organism, fixed by heredity", and:

> That an I.Q. is simply a score on a particular test. As such, it not only varies somewhat with the nature and context of the test, but it is also susceptible to all the influences that affect behavior. For a proper interpretation of any I.Q. we therefore need information on: (1) the test from

> which it was obtained, and (2) the experiential background of the individual, insofar as it may have affected the type of behavior functions sampled by the test. (p. 82).

She then raised the question of the extent to which coaching and practice can raise the test performance of the subject in group or individual tests and cited the evidence from studies done by several other workers like Adkins (1937), Cattell (1931), Crahe and Helm (1950), all of whom found significant mean gains in score upon retests within periods ranging from a few days to a year, the extent to which the gains persist or level off being dependent upon the type or difficulty of the test and the ability level or degree of test sophistication of the subjects. She further cited the later studies by a number of British pshychologists like Dempster (1954), James (1953), Vernon (1954), Wiseman (1954), Wiseman and Wrigley (1953), and Yates (1953), who were also concerned with the effect on eleven year old children of coaching and practice in tests for selection for entrance to secondary schools, all of whom supported the earlier findings but found that the extent of the improvement which reached up to fifteen points after coaching and practice, was greater in the case of testees with deficient educational backgrounds, and that excessive coaching tended to result in a relative decrease in score gains.

Among the studies cited by Anastasi (1958) on the effect of nursery school attendance on subsequent intellectual development were the investigations of Wellman et al. (1940), carried out at Iowa University. In one of these studies 652 children of age range 18 to 77 months who

attended either the nursery school or the kindergarten conducted by the University were given either the Stanford-Binet or the Kuhlmann-Binet tests in the fall and again in the spring of each year of pre-school attendance. The scores showed a mean gain of 6.6 I.Q. points during the first year of attendance while those who remained in the nursery school or kindergarten continued to show increases in I.Q. although decreasingly so each year, but no significant correlation was found between gain in I.Q. and the actual number of days attended during the year which ranged from 37 to 148 days.

For purposes of comparison Wellman matched 34 of the pre-school children with 34 non pre-school children in chronological age and initial I.Q. The pre-school group gained an average of 7.0 points between the fall and spring testing, while the control group lost an average of 3.9 points. The Iowa investigation therefore came to the conclusion that nursery school attendance resulted in a gain in I.Q.

Citing lonitudinal studies, Anastasi (1958) also concluded that in the various approaches to determine the effect of school on tested intelligence studied in nursery school education revealed that nursery school attendance has little or no effect upon the I.Q. of children from better home backgrounds, but that the "Children from underpriviledged environments show appretiable gains in I.Q. following nursery school experience", and that "Longitudinal investigations of populations over periods ranging from about 10 to 25 years have revealed a slight but

significant trend for I.Q. test performance to rise as a result of intervening changes of educational and cultural facilities", a view also supported by Burt (1946) and Cattell (1951).

Douglas (1964) and Douglas et al. (1965) also reported that in the case of eleven year old children from the upper middle classes attending British primary school, "Mental ability and school performance test scores are unaffected by the amount of absence from school, but in all other social classes considerable effects are recorded". The children who are consistently absent or who are often absent in the last two years at primary school make lower scores at eleven, and show relative deterioration in scores between eight and eleven years. He further pointed out that children who are often away in the first two years but make good attendances in subsequent years catch up, but not if they come from the lower manual working class or attended primary schools that have a poor academic record, hence manual working class children get fewer grammar school places than is expected.

Nutritional factors

During the past decade, several studies from different parts of the developing world have suggested an adverse effect of malnutrition on cognitive development of young children. These studies include reports from East Europe, South and West Africa and Latin America. Whatever

the etiology or nature of the nutritional deficiency in these studies, their results suggest that both undernutrition and malnutrition affect the capacity of the young child to benefit from the environment and to show normal psychological development.

A review of Soviet studies on nutrition and higher nervous activity (Brozek, 1962) reported that when the intake of a variety of essential nutrients was inadequate, changes in conditioned reflexes occurred, and were reflected in the modification of acquisition rate, maintenance and extinction. The capacity to establish new conditioned reflexes was said to be the first function affected. However, as the malnourished state continued, even previously well established reflexes were depressed or abolished.

A longitudinal study of undernourished Cape coloured children in South Africa (Stack and Smythe, 1963, 1968) reported values for height, weight, head circumference and mean intelligent quotients well below an adequate nourished group at various follow-up stages from infancy to middle childhood as well as defects of visual-motor ability and pattern perception. In addition, the better nourished control group had a better time concept and higher achievement motivation scores. Interpretation of the findings, however, was made difficult by differences in nursery school experience in the two groups (the control group attended, the experimental group did not). There was also no way to separate the nutritional from other environmental factors in the study by Cabak and

Najdanvic (1965) in whicc Serbian children who were malnourished in infancy had lower I.Q. scores. Studies with Ugandan children by Gerber and Dean (1956) and the investigations with Mestizo and Indian populations in Mexico, Guatemala, Venezuela and Chile, all reported lower scores on the Gesell Development Schedules with retardation most pronounced in adaptive and language development at pre-school age (Cravioto, De Licardie, and Birch, 1966; Moenckeberg, 1968). Inadequacy in intersensory integrative ability was reported for rural Mexican and Guatemalan school-age children who scored in the lowest quartile in height (Cravioto and De Licardie, 1968).

Werner and Muralidharan (1970) analyzed the physical, cognitive and achievement status of two groups of Indian pre-school children who came from low middle class urban backgrounds and attended nursery school, but who differed in adequacy of nutritional status. Differences between the two groups in height, weight, and head circumference at age five were all significant, favouring the adequately nourished group, and so was the difference between the two groups in growth rate of head circumference between 2 1/2 and 5 years. In the measures of cognitive development, both boys and girls in the adequately nourished group scored well within the normal range of intelligence, the inadequately nourished children of both sexes scored in the 'slow learner' range. I.Q. variations were more pronounced for the inadequately nourished children and most pronounced for the inadequately nourished girl.

These findings of a 15-20 I.Q. point difference between children exposed to similar home environments and pre-school education but varying in nutritional status are similar to I.Q. differences reported by Kugelmass, Poull, and Samuel (1944) who studied groups of undernourished children in the age range from 2 to 9 years before and after improvement in diet. They found an average rise in I.Q. of the undernourished children of 18 points after nutritional therapy. The earlier the age at which nutritional therapy was instituted, the higher the rise in I.Q. After age 4, the rise in I.Q. was insignificant.

Studies conducted using both animals and humans denote a positive correlation between maternal dietary deficiencies and affected fetal development. Birch and Gussou (1970) quote numerous studies in this field of which perhaps some of the most significant relate to the wartime experiences in England and Norway. As well, more recent studies conducted measuring the before and after effects of increased protein and caloric intake, show significant changes in fetal development.

In the British wartime experiment, an effort was made to upgrade the diet of its people - especially those of children and pregnant women. They found that during the five year period between 1940-1945, the still-birth rate in England and Wales underwent an accelerated decline, falling from 38 per 1000 births, to 28 per 1000 births. Thus, signifying in a particular instance, the effects of improved diet on the pregnancy.

In Canada, according to Ian Adams (1971):

> The infant mortality rate in 1968 was 21 per 1000 live births for all Canadians, 49 per 1000 for Indians, and 89 per 1000 for Eskimoes. Among Indians as a whole, infant mortality has declined during the past decade from three times the maternal rate to just over twice the rate.

Of interest, at this point, is a statement by Birch and Gussou (1970) that:

> .... prematurity may represent the appropriate termination of a pregnancy complicated by an already imperfect relationship between mother and fetus, for fetuses which are primarily defective or otherwise in trouble 'in vitro' are more likely to be born before term, often following a complicated pregnancy, than are those infants not so threatened in the womb. On the other hand, infants who are born prematurely, even when no history of complications is present and no congenital abnormality is visible, are more liable to abnormal development than are infants born at term (p. 50).

Drillien (1965) found that of 72 children weighing three pounds or less at birth, who had passed school entering age, 75% had some congenital defect or mental retardation. Over one-third of the total group are ineducable in normal schools for reasons of physical or mental handicaps, or both. Over one-third are dull children who will probably be retained in normal school but will require special educational treatment and less than one-third are low average, average, or above average in ability.

Finally, Birch and Gussou (1970) report that the single most common behavioral finding in malnourished children is apathy accompanied by irritability. Evidence thus points to the fact that the response of a

malnourished child to significant stimuli in his environment would be significantly reduced. And, as Birch states, "Given the nature of the personality changes which accompany acute malnutrition, it is not surprising that children with severe clinical illness arising from protein calorie malnutrition should show depressed levels of intellectual functioning".

Socioeconomic and cultural factors

Large scale studies carried out in the USA have revealed a high degree of correlation between occupation and intelligence in adults. A similar degree of high correlation between intelligence and achievement test performance and children classified according to their parental occupation has been found. McNemar (1962) during the collection of data for the revised standardization of the Stanford-Binet scale found that the mean I.Q.'s varied from 117.5 for children in the age group 10-14 years, of professional parents to 97.2 for children, in the same age group, of urban and rural day labourers. Similar findings were previously found by Neff (1938) and Loevingar (1940) suggesting that there is generally a difference between the mean I.Q.'s of the children of unskilled labourers in favour of the former. In a series of studies carried out by Havighurst et al. (1944, 1947, 1949) for the purpose of studying the relationship between test scores and social class membership of individual testees, almost

complete samples of 10, 13 and 16 year old children were selected. Thurstone tests of Primary Mental Abilities were administered to the 13 year olds, but the two other age groups were tested by verbal and performance tests as well as by spatial and mechanical aptitude tests. Each testee was classified into one of the five status groups ranging from A to E. Nearly all the tests showed a tendency for mean scores to rise with social class within each sample. Most of the differences between the highest and lowest social groups were found to be statistically significant with the exception of the 16 year old boys age group in which the highest mean scores were by the lowest status group in the Minnesota Mechanical Assembly test, probably due to their greater familiarity in the handling of mechanical objects.

Anastasi (1958) had, however, emphasized that in "Making comparisons of intellectual and socioeconomic variables one must not lose sight of the wide range of variables within each social level nor of the overlapping between levels". Fleming (1943, 1958) in support of this view asserted that while relatively more intelligent children come from the most prosperous homes, the largest absolute number of intelligent children is to be found at the lower (though not the lowest) socioeconomic levels. Floud et al. (1956, 1961), who had studied the socioeconomic handicaps affecting educational opportunity of children of non-manual workers with respect to selection for grammar school education in England and Wales, also pointed out that one in six from manual working class families as

ompared with one in two from non-manual homes gained grammar school places at the age of 11+. But she too advises caution in making generalizations in this regard stating that "Although the relations between ability, social class and educational performance are known in broad terms they have not yet been precisely worked out", and that "We evidently need a thorough investigation of the relationships between these three variables throughout the whole range of each".

Further support for the point of view that the disparity of test performance between children of the upper and lower socioeconomic levels is due not merely to difference in intelligence but to a large extent to social forces is found in an article by Marshall (1953) reprinted by Halsey et al. (1961) from which the following extract is taken:

> That there is a greater preponderance of working class children in modern schools today is a fact which no one is likely to dispute ... Messrs. Halsey and Gardiner produce evidence to show that, in the London areas they studied, this uneven distribution could not be attributed solely to the intelligence of the children, but must be to a large part the result of social forces. When, for instance, comparison was made of the two groups with the same mean I.Q., one of which had been assigned to a grammar school and the other to a modern school, it was found that the middle classes were heavily over-represented and the working classes, especially the unskilled families, heavily under-represented in the grammar school group. It is also interesting that of working class children in grammar schools in the areas studied 65% came from small families with one or two children and 37% from larger families with three or more. Among working class children in modern schools, the proportions were almost exactly the reverse, and among middle class children there was no significant relation between type of school and size of family. No known correlation

> between fertility and intelligence could possibly explain this, and it is clear that powerful social forces are at work (p. 305).

Davis (1949) also reported his findings in his study carried out in 1946 along with Havighurst at the University of Chicago to examine the social class cultural influence upon the responses of pupils to intelligence tests of mental activities, which unlike the then existing group tests "will not be limited to prediction of simply those activities essential to success in learning the existing school curricula". He stated that the narrow scope of the tests penalized most heavily the pupils of the lower socioeconomic groups, because those groups had the least training and motivation to solve academic problems.

The research he cited was planned to cover five years. The project included (1) an item analysis of the responses of two socioeconomic groups of pupils to ten group tests of intelligence, (2) an exploratory study of problem-solving activities in two socioeconomic groups, (3) an experimental study of the effect of practice, motivation, item-content and item-symbols upon the paper and pencil responses of two socioeconomic groups, (4) experimental studies of learning of laboratory problems by two socioeconomic groups, (5) the construction of new individual and group tests of general problem-solving behavior.

He further explained that the first step in the research was to measure the relative success attained by different socioeconomic groups of pupils on the specific questions (items) in ten of the most widely used group

tests of general intelligence in order to identify those items which proved relatively easy or difficult for pupils of each socioeconomic stratum in the population in a midwestern city. All the children of ages 9, 10, 13 and 14 were listed, and they were classified according to socioeconomic status.

The results showed that a large proportion of the items in each of the tests discriminated between children from the highest and lowest socioeconomic levels, the range of difference being 46%-100%, although the tests were standardized for grades (and therefore for age groups) which are lower than the mean grade-placement and mean age of the testees, so that many of the items would be easy for the sample and thus would not allow the higher socioeconomic group to demonstrate its superiority over the lower in this type of problem. Since there was such a wide variation in the amount of difference between the high and low socioeconomic groups, depending on what test was used, he concluded that at least part of the difference must be due to the nature of the material in the tests themselves.

Davies went on to state the limitations of group tests for assessing the abilities of children drawn from different cultural backgrounds owing to their differences in their upbringing, motivation, experience and patterns and development of speech. He argued that:

> If intelligence tests are to be used, for example, in public school systems in a democracy, it is absolutely essential that such tests should be good measures of mental behavior in all large ethnic, racial and socioeconomic groups. In most of our schools, several different cultural

> groups attend the same classes. To begin with, then, the maker of an I.Q. test has to set himself the task of devising a measure which is applicable to a wide range of socioeconomic groups (p. 106).

He pointed out further the cultural bias of the standard tests in that their content and language are more appropriate for assessing the abilities of the higher and middle socioeconomic groups, but that they could not satisfactorily measure ability in the higher and lower socioeconomic groups seeing that they do not use problems which are equally familiar and motivating to all such groups.

A similar point of view was expressed by Biesheuval (1949) who in setting out the problems of inter-racial group testing stated:

> Allowance is generally made for the effect of schooling on test performance by eliminating tests for which such scholastic skills as reading, writing and arithmetic are required. As schooling also improves familiarity with pictorial representation, the use of pencil and paper, the perception of abstract relations, manipulative skills and habits of work and attention, the control of the educational factors cannot be achieved merely by choosing tests without an obvious scholastic content. The extensive control of the educational factors which appears to be desirable cannot, however, be achieved, unless the two races to be compared share a common culture or one has thoroughly assimilated the culture of the other and enjoys equality of opportunity with it (p. 58).

In a pioneering study of adopted children and their adoptive and natural parents, Skodak and Skeels (1949) reported greater correlations of children's I.Q.s with their natural than with their adoptive parents' I.Q.s. This result has been often misunderstood to mean that the children's levels of intelligence more closely resembled their natural parents', which is

completely false. Although the rank order of the children's I.Q.s resembled that of their mothers' I.Q.s, the children's I.Q.s were higher, being distributed, like those of the adoptive parents, around a mean above 100, whereas their natural mother's I.Q.s averaged only 85. The children, in fact, averaged 21 I.Q. points higher than their natural mothers. The unexpected boost in I.Q. was presumably due to the better social environments provided by the adoptive families.

More recently several other workers, like Fraser (1959), Bernstein (1958, 1961), Vernon (1961, 1965) who, among others, studied various aspects of the effect of cultural factors on test performance, have arrived at conclusions supporting the previous findings. Fraser (1959) in a study of a sample of 12 year old children in the city of Aberdeen attempted to assess the extent to which factors in the home environment other than intelligence affected the progress of children at school. Among her findings was that three of the factors most closely related to achievement of those investigated were parents' attitude to education and future employment, parents' income, and amount of space in the home. She found significant correlations between I.Q., achievement and all three variables. The correlation of a summation score for those variables with I.Q. was .69 and .75 with achievement.

Bernstein (1958) pointed out the limitations of social origin on perception and in a later article (1961) postulated the theory that there are two linguistic codes, the 'formal' and the 'public', and that middle class children learn both while lower class children use only the public

code with all its various defects; hence the latter are always at a disadvantage in the school situation owing to the language handicap. In a further study (1962) he obtained speech samples of middle and working class groups and examined as well as analyzed the hesitation phenomena from a discussion situation, in order to find the overall social class differences. He found that the working class group used a shorter mean phrase length, spent less time pausing, and used a shorter word length. When non-verbal intelligence was held constant he found social class differences in the same direction. Holding verbal and non-verbal intelligence constant, the same social class differences were found with the exception of word length. He also found that within the middle class group, the subgroup with superior verbal intelligence used a longer mean phrase length, while within the working class group, the subgroup with the average I.Q. profile spent less time pausing. These findings supported his earlier two-code language theory and the consequential differences in verbal planning orientation of children from the middle and lower classes.

Luria and Yudovich's account (1959) of the identical twins who suffered exceptional deprivation of oral language stimulus and the subsequent greater acceleration of speech and intellectual ability on the part of the one who was given special oral teaching, strengthens the evidence for good language experience being an important determining factor of optimum intellectual development. The relationship of this quality of experience to socioeconomic background, as Bernstein shows, is quite evident.

A study by Ravenette and Kahn (1962) carried out to compare the verbal and performance I.Q.s of children within a disturbed working class population also substantiated Bernstein's findings that with increasing age, working class children tend to fall further and further behind.

In another study to examine the social class differentials in vocabulary of working class and middle class children at two age levels, 9½ - 10½ years and 13½ - 14½ years, schools were selected in which the majority of children came from either working class or middle class backgrounds, and the sons of skilled manual labourers or artisans were eliminated. The younger boys were given the non-verbal colored progressive matrices test and the older ones the standard progressive matrices. For vocabulary assessment, the self judging Vocabulary Scale (S.J. Scale) devised by Heim and Watts (1961) was used. It was found that the working class children's vocabulary at age 10 was on the average two-thirds of that of their middle class peers, declining to just over one-half by the age of 14 years. In general, the findings supported the view that working class boys who remain within a working class environment tend to lose further ground in vocabulary expression between the age of 10 to 14 years.

Vernon (1961) pointed out that the poor test performance of those Jamaican children who are handicapped by physical, socioeconomic as well as educational and cultural factors, may be equally due to hereditary as to environmental factors. He disagreed with the views of Burt and Burke based on their studies in England and America that at least 80% of the difference

in intelligence can be attributed to hereditary factors and 20% to environment, and he cited in support of his contention the opinion of Medawar (1960) that heredity and environment interact with one another from conception onwards in so complex and variable fashion that it is impossible to disentangle them. In order to eliminate or minimize the inequalities of test performance at the secondary school selection examination due to differences in home background, upbringing, and other social and environmental factors, Vernon posed the following question: "Cannot a better selection be made by using suitable intelligence tests and relying less on attainment which largely reflects previous upbringing and training?". To this he stated:

> I have shown in Chapter 3 that this dichotomy is to a considerable extent fallacious, and that the further one tries to get away from tests that are culturally conditioned, the less accurate they become as predictors of future educability (p. 61).

He developed the argument further by pointing out that the tests used at the time in Jamaica are defective mainly because they were geared to a much higher and more sophisticated level of intelligence and educational development than is to be expected of Jamaican eleven year old pupils. The tests, he further stated were "Too highly speeded and too frightening except to children who had received very much coaching". He therefore concluded that the answer to the problem was to devise tests locally which give the unsophisticated country pupil, for example, a somewhat better chance. But this does not mean that they can ever completely eliminate environmental

differences.

In a report of a continuing longitudinal study of over 5,000 children in Scotland and Wales, Douglas (1964) studied the following variables: parents' interest, parental encouragement, and the educational ambition of the parents for the child. He found that the attitude of children to their school work is deeply affected by the degree of encouragement their parents give them and this in turn has a positive effect on achievement. The middle class children are less influenced by their parents' attitudes than the manual working class children are, and tend to work hard even when their parents appear to lack interest. Douglas states this may reflect the high educational aspirations of the neighbouring middle class families from which they draw their friends.

Schmidt (1966), in a cross-cultural setting in South Africa, where children enter school at various chronological ages, has found that performance on the Ravens was influenced, not by chronological age per se, but the number of years of schooling. Among the environmental variables, then, schooling was the all-powerful agent in determining I.Q. and achievemdnt and SES fades into insignificance. In the same study Schmidt went on to add that "The attitude of the whole community towards schooling, and how this attitude affects the pupils, as well as the congruence, or lack of it, between the experiences of the child in the home and the school, are crucial factors".

Wolf (1966) devised a questionnaire that attempts to look at differences

that may exist with various sub-populations. He constructed a test that looked at parental interests and aspirations regarding the schooling of their children. Achievement test scores and I.Q. scores were obtained from school files for 60 fifth graders in the homes selected for study. The environmental data and the test data were then systematically related. His major finding showed a correlation of .69 between parental attitude and I.Q. This can be contrasted with the correlation between SES and measured general intelligence which has been found to lie between .20 and .40. It would seem that this newer approach to the measurement of home environment accounts for over two times as much of the variance in general intelligence as a measure of SES.

The second major finding in Wolf's work concerns the relationship between parental attitude and the development of academic achievement. The correlation between the two is .80. Again, this may be contrasted with the correlation between SES and academic achievement which has been found to be of the order of .50.

These findings would suggest that the conception of a single physical environment consisting of a number of sub-environments for the development and maintenance of specific characteristics is a powerful one indeed, and if fully developed, could greatly enhance our understanding of the interaction process between the individual and the environment.

Dyer (1967), using Wolf's study as a basis, constructed a similar questionnaire called the Index of Educational Environment in the Home (I.E.E.).

He administered this test to parents of 60 children from low and high SES groups in two schools in Trinidad.

For the middle class group, the correlation between achievement and SES and between achievement and I.E.E. were - .07 and .67 respectively. For the low SES group, the correlations were .01 and .78. Taken singly then, the I.E.E. proved to be a more reliable predictor of achievement than the measure of SES.

In the report of the Plowden Committee on English Primary Education (1967) it was reported that the variation in the children's school achievement and I.Q. is specifically accounted for by the variation in parental attitudes rather than by either the variation in the material circumstances of parents or by the variation in schools. This effect increases as the child grows older. The report went on to comment that "The fact that attitudes play so large a part is hopeful, since it is at least possible that attitudes may be open to persuasion". Wolf and Dyer's findings have thus found general acceptance.

In the highly informative and massive report on Equality of Educational Opportunity by Coleman, et al. (1966), over 600,000 children and 4,000 schools were investigated. The sample included a cross-section of low and high SES White, Black, Puerto Rican, Mexican American and American Indian children in grades 1, 3, 6, 9 and 12. We are concerned here with that part of the study that deals specifically with the effects of environment on achievement. In the report, environment refers to school

environment. Listed below is a summary of the major findings.

1. The achievement of low SES children depends more on the schools they attend than does the achievement of middle SES children. For example, 20 per cent of the achievement of Negroes in the South is associated with the particular schools they go to compared with only 10 per cent of the achievement of Whites in the South. In effect, middle SES pupils are less affected one way or the other by the quality of their schools than are low SES pupils. This indicates that it is for the most disadvantaged children that improvements in school quality will make the most difference.

2. Pupil achievement is strongly related to the educational backgrounds and aspirations of the other students in the school. Analysis indicates that children from a given family background, when put in schools of different social composition, will achieve at quite different levels. This effect is again less for middle SES pupils than for low SES pupils. In other words, if a middle SES pupil from a home that is strongly and effectively supportive of education is put in a school where most pupils do not come from such homes, his achievement will be little different than if he were in a school composed of others like him. But, if a low SES pupil from a home without much educational strength is put with schoolmates with strong educational backgrounds, his achievement is likely to increase.

This general result has important implications. The report shows that the principal way in which the school environments of low and middle SES children differ is in the composition of their student bodies, and it

turns out that the composition of the student bodies has a strong (.80) correlation to the achievement of low SES students.

3. The amount of variation in achievement that school characteristics accounts for depends much more on the people at the school - other students and teachers - than on facilities and curricula. The specific characteristics that showed the strongest relation to achievement were the educational backgrounds and educational aspirations of other students at the school and, to a smaller extent, the backgrounds and achievement of teachers. The educational backgrounds and aspirations of fellow students appear to provide a facilitating or amplifying effect on the achievement of a student independent of his background. This being the case, schools in low SES areas beginning at an educationally impoverished level will tend to remain at that level.

4. A pupil attitude factor which appears to have a stronger relationship to achievement than do all the school factors together, is the extent to which an individual feels that he has some control over his destiny (Locus of Control). The responses of pupils in the survey show that low SES pupils have far less conviction than middle SES children that they can affect their own environment and futures. When they do, however, their achievement is higher than that of middle SES students who lack that conviction.

This characteristic for the low SES students appears to be related to the proportion of middle SES students in the school. Those low SES students in schools with a higher proportion of middle SES students have a

greater sense of control. This finding suggests that the direction such an attitude takes may be associated with the pupil's school experience.

Building upon the work of Wolf (1966), investigators at the Arizona Center for Early Childhood Education have sought to determine the applicability of such variables to populations of young minority group children in the American Southwest. In the first of these investigations by Henderson and Merritt (1968), it was demonstrated that a modification of the Wolf scale could discriminate clearly between higher and lower performing Mexican-American children. A follow-up investigation by Henderson (1969), demonstrated that the environmental process variables that had been obtained when the subjects entered first grade predicted reading achievement on the California Reading Test at the end of the third grade with correlation coefficients significant at the .05 level or better for each of the nine environment variables measured. These and similar investigations (Garber et al. 1969) provide evidence that environmental characteristics are related to achievement.

In the Milwaukee Project, Heber (1971) provides interesting data from early intervention programs. The project worked with ghetto children whose mothers' I.Q.s were less than 70; intervention began soon after the children were born. Over a four year period Heber intensively tutored the children for several hours every day and produced an enormous I.Q. difference between the experimental group (mean I.Q. of 127) and a control group (mean I.Q. of 90).

Garcia (1972) looked at the egalitarian structure of the Israeli

kibbutz and the diversity of cultural background among its members. He found that outside the kibbutz in Israel, Jewish children of European parents have a mean I.Q. of 105, while a mean I.Q. of children of first generation oriental Jews is only 85. However, when children of both groups grow up in the kibbutz nursery, after four years, they achieve exactly the same mean I.Q. scores - 115 points. Garcia is cautious about concluding that the Oriental home inhibits intellect, or that the kibbutz environment stimulates it. He says it is far likelier that the Oriental home develops facets of intellect that are invisible to I.Q. tests, while the kibbutz makes a child test wise.

Mercer (1972) examined the relationship between the cultural and economic factors of a child's background and his score on the I.Q. test. She attempted to check the hypothesis that what the I.Q. test measures, to a significant extent, is the child's exposure to Anglo culture. A sample of 598 Chicanos and 339 Blacks (the total population of three segregated minority schools) were used in her study. Each Black and Chicano child was given a score from zero to five, depending on the number of characteristics that his family shared with the average Anglo family in the same community. The five characteristics were:

1. fewer than three children;
2. the mother expected the child to get some college education;
3. the father grew up in a city and completed at least the ninth grade;
4. the child comes from a home-owning family or from a family that

is buying their home;

5. English is spken most or all of the time.

If the child's family matched the Anglo model on all five points, the child had a score of five. If his family matched on one point, he had a score of one.

The average I.Q. for all the Chicano children was 90.4, some ten points below the mean for Anglo children. But when the Chicano children were divided into their five groups, the average I.Q. of each group differed significantly:

1. The 127 children who were farthest from the Anglo middle-class pattern - those who had no matching background characteristics or only one - had an average I.Q. of 84.5.
2. The 272 children with two or three matching characteristics had an average I.Q. of 88.5.
3. The 174 children with four matching points had an average of 95.5.
4. The 25 children whose families matched the average White family on all five points had a mean I.Q. of 104.4 - slightly higher than the Anglo average.

Similar results were found for Black children. Before controlling for background, their average I.Q. was 90.5. The children whose families were least like the average Anglo family had an average I.Q. of 82.7. But those whose families matched the Anglo pattern best had an average I.Q. of 99.5, exactly at the national norm for the rest.

From Mercer's study it would appear that when you control for the social backgrounds of the children, there are no differences in intelligence between the Anglos and the Blacks, or between the Anglos and the Chicanos.

Vernon (1973) tested grade 5 students from both middle and lower class schools on a variety of tests encompassing both level I and II abilities. He found highly significant differences in level II tests between the two groups and no significant difference on level I tests. However, no significant difference was found between the two groups on Raven Matrices which Jensen singles out as a good level II test. He concluded that Jensen's more general points regarding class differences on different types of ability tended to be confirmed, though he felt it unlikely that associative learning is a sufficiently broad or stable factor to be of any great importance educationally or socially. Some of Jensen's more detailed hypotheses, implying interaction of level I and II abilities were not confirmed at any acceptable level of significance.

Molloy (1973) tested both grades 1 and 4 students on a variety of tests to measure differenses between level I and II abilities. When the two grades were considered separately, only the grade 1 results confirmed the hypothesis that high SES children will be more proficient on level II tasks. This was not the case for grade 4 students since, with the exception of the culturally loaded PPVT, SES differences on level II measured were not apparent. Molloy concluded that within a relatively homogeneous environment, schooling exerts a modifying influence on cognitive task performance. In the same

study, Molloy also looked at the correlations between level I and II abilities between the two SES groups. His results clearly disconfirmed the prediction that level I and level II are more closely related in the high SES groups.

In this chapter I have reviewed some of the relevant research dealing with the concept of intelligence and the nature-nurture controversy that surrounds it. Jensen's two level theory of intelligence was examined and also his assumption that 80 per cent of the variance in intelligence can be attributed to heredity. Using this assumption as a starting point, Jensen compares different SES groups and concludes that low SES children are genetically less intelligent than middle and high SES children. On the other hand, various studies have been cited in which some non-genetic variables dealing with nutritional, socioeconomic and cultural factors have been found to contribute a significant amount of variance to measured intelligence. Some of the more recent research seems to indicate that SES is too broad a concept and is not a sufficient index of a child's home environment. As a result, new tests are appearing that attempt to look at differences within as well as between various samples.

CHAPTER III

PROCEDURE AND HYPOTHESES

Descriptions of sampling, tasks and experimental procedures are presented in this chapter. Also included is a formal statement of the major experimental hypotheses as these relate to subject characteristics.

THE POPULATION

The population from which the samples were drawn included students from the Edmonton Public School System. All the children were male, between the ages 9.0 - 10.0, and in grade four during the testing period.

An initial survey of the students in the Edmonton Public School System was made in an attempt to find those schools that contained fairly equal proportions of both low and middle SES students. Of the schools visited, five were chosen as best representing equal proportions of low and middle SES students. The sampling procedure of perusing the students cumulative Records at the five schools was in accord with the following guidelines:

1. The upper cut off point for the low SES group was set at a Blishen rating of 42.6.
2. The lower limit of the middle to high SES group was set at a Blishen rating of 40.2.

The following information was also gleaned from the cumulative records: (a) Lorge-Thorndike Intelligence Test score, (b) Reading Achievement score (California Achievement Test), and (c) Mathematics Achievement score (Edmonton Public Schools Math Achievement Test).

After completion of the survey, two groups were selected from the two extremes of the Blishen scale representing low and middle to high SES students.

The SES status rating used in matching the two groups was the occupational class scale by Blishen (1961). The scale was constructed from Canadian census data and is an occupational ranking according to combined standard scores for income and years of schooling. The various occupations are assigned a rank value. Appendix 10 contains the complete listing of rank order occupations.

A comparison between the Blishen scale and the ratings of occupational prestige in the United States showed a rank correlation of .94 (Blishen, 1961). The scale has been used extensively in Canada. MacArthur (1969) defines his cross cultural samples of children from Eskimo, Indian-Metis and White populations on the Blishen scale, and Das and Chambers (1970) utilized the scale in their Alberta report on socioeconomic status and cognitive development.

Because of the possibility of ambiguous information in the cumulative record cards pertaining to the parents' occupation, the parents were contacted by telephone for verification and clarification. In the case where both parents were working, the higher classification of the two occupations was

recorded.

The mean ratings for the low and high SES groups were 40.2 and 59.5 respectively. Analysis of variance established a significant difference in SES between the two groups. A summary of the group differences according to socioeconomic status is shown in Table 1.

TABLE 1

GROUP DIFFERENCES ON THE BLISHEN SCALE OF SES

	Low SES N=30	High SES N=30
Range of Scores	32.0 - 43.6	48.2 - 81.2
Mean	40.2	59.5
Standard Deviation	4.60	8.34
F(df = 1,58) = 119.0 (p .001)		

TESTING CONDITIONS

In all cases, testing was completed at the school in which the child attended. The most frequent space that was allotted for testing was the school medical room; the Counsellor's office was used when available. Total testing time was approximately two hours per student. Because of the

similarity of some of the tests and the time involved, half of the tests were administered on one day and the remaining tests on the following day. Table 2 illustrates the order in which the tests were administered, whether they were group or individual tests, and the approximate time required for completion of each test.

TABLE 2

ORDER IN WHICH TESTS WERE ADMINISTERED

	Test	Type	Time
	DAY I		
1.	Making X's	Group	10 min.
2.	Intellectual Achievement Responsibility Test (I.A.R.)	Group	15 min.
3.	Figure Copying Test	Group	15 min.
4.	Short Term Memory (Visual)	Individual	20 min./per subject
	DAY II		
5.	Short Term Memory (Auditory)	Individual	10 min./per subject
6.	Ravens Colored Progressive Matrices	Individual	20 min./per subject
7.	Cross-Modal Coding (CMC)	Individual	30 min./per subject

As was mentioned earlier in this chapter, the results of the Lorge-Thorndike Intelligence Test and Reading and Mathematics Achievement tests were taken from the student's cumulative record. In total, results of ten tests were recorded, eight of these dealt with a variety of cognitive abilities, one measured the students' feeling of powerlessness and the other attempted to assess student motivation. A detailed description of each of these tests appears later in this chapter. The eight cognitive tests were chosen to represent a continuum of skills based on Jensen's Level I and Level II abilities. Level I ability infers pure memory and is represented by two short-term memory tests, one visual and one auditory. Level II ability infers abstract reasoning and is represented by the Ravens Coloured Progressive Matrices test. The remaining five cognitive tests fall somewhere inbetween the two extremes of Level I and II abilities.

Besides the tests that were administered to the students, parents of the students were also tested in the study. Parents were interviewed on an Index of Educational Environment Scale (I.E.E.) in an attempt to assess more accurately the type and amount of educational support available to the students within the home environment. The parents were also asked to complete an Internal-External Locus of Control (I-E) test.

Arrangements for interviewing the parents of the students were made by telephone. The interview was conducted in the parents' home in the evening and lasted approximately one hour.

DESCRIPTION AND EXPERIMENTAL PROCEDURE OF THE TESTS

1. Making X's Test

The Making X's Test is intended as an assessment of test-taking motivation. It gives an indication of the subject's willingness to comply with instructions in a group testing situation and to mobilize effort in following those instructions for a brief period of time. The test involves no intellectual component, although for young children under six years of age it probably involves some perceptual-motor skills component. The wide individual differences among children from 2nd to 6th grade therefore reflect motivation and test-taking attitudes in a group situation (Jensen, 1970). The test also serves partly as an index of classroom morale, and it can be entered as a motivator variable into correlational analyses with other ability and achievement tests. Children who do very poorly on this test are likely not to put out their maximum effort on ability tests given in a group situation and therefore their scores are not likely to reflect their true level of ability.

The Making X's Test consists of two parts. On Part I the student is simply asked to make X's in a series of squares for a period of 90 seconds. In this part the instructor says nothing about speed. The children are merely told to make X's. The maximum score on Part I is 150, since there are 150 squares provided in which the child can make X's. After a 2 minute

rest period the students turn the page of the test booklet to Part II. Here the students are instructed to show how much better he can perform than he did on Part I and to work as rapidly as possible. The child is again given 90 seconds to make as many X's as he can in the 150 boxes provided. The gain in score from Part I to Part II reflects both a practice effect and an increase in motivation on effort as a result of the motivating instructions. A copy of the Making X's Test is contained in Appendix I.

2. Intellectual Achievement Responsibility Test (IAR)

"The effects of reward or reinforcement on preceding behavior depend in part on whether the person perceives the reward as contingent on his own beahvior or independent of it", (Rotter, 1966). Without this belief, the actions and the reinforcement following it may be perceived as fortuitous. Cromwell (1963) and Rotter (1966) have demonstrated both individual and group differences on this variable labelled Locus of Control. The function of this variable determines the interaction of an individual with his meaningful environment, and influences the form of his generalized expectancy regarding the causal nature of "Behavior-outcome sequences" (Rotter, 1966). The internal-external locus of control (I-E) is closely related to a person's awareness of success and failure and his reaction to these. Inability to conceptualize failure co-exists with external control (Cromwell, 1963).

The I-E scales devised by Rotter were constructed for adults. Crandall, Katkovsky and Crandall (1965) constructed the Intellectual Achievement

Responsibility (IAR) Questionnaire specifically aimed at assessing children's beliefs in reinforcement responsibility exclusively in intellectual-academic achievement situations. Unlike the I-E scale, the IAR scale was constructed to sample an equal number of positive and negative events. The authors felt that the dynamics operative in assuming credit for causing good things to happen might be very different from those operative in accepting blame for unpleasant consequences. Thus, the IAR was so constructed that, in addition to a total I (internal or self) responsibility score, separate subscores could be obtained for beliefs in internal responsibility for successes (I+ score) and for failures (I- score).

The Children's IAR Scale is composed of 34 forced-choice items. Each item stem describes either a positive or a negative achievement experience which routinely occurs in children's daily lives. This sentence is followed by one alternative stating that the event was caused by the child and another stating that the event occurred because of someone else in the child's immediate environment. The items along with the administrative instructions are presented in Appendix 2. Internal alternatives are designated by an I. Positive-event items are indicated by a plus sign, and negative events by a minus sign following the I. A child's I+ score is obtained by summing all positive events for which he assumes credit, and his I- score is the total of all negative events for which he assumes blame. His total I score is the sum of his I+ and his I- subscores.

The reliability of the children's IAR responses over time is moderately high. Forty-seven of the children in grades 3, 4 and 5 were given the test

a second time after a 2 month interval, for these children, the test-retest correlations were .69 for total I, .66 for I+ and .74 for I- (Crandall et al., 1966).

3. Figure Copying Test

This test was developed at the Gesell Institute of Child Study at Yale University (by Ilg and Ames, 1964) as a means for measuring developmental readiness for the traditional school learning tasks of the primary grades. The test consists of 10 geometric forms, arranged in order of difficulty, which the child must simply copy. The test involves no memory factor, since the figure to be copied is before the child at all times. The test is administered without time limit. It is best regarded as a developmental scale of mental ability. It correlates substantially with other I.Q. tests, but it may be regarded as considerably less culturally loaded than the usual I.Q. test. It is not primarily a measure of perceptual-motor ability but of cognitive development (Jensen, 1970).

Each of the ten figures are scored on a three-point scale going from zero to two. A score of zero is given if the child's attempted drawing totally fails to resemble the model. A score of one is given if there is fair resemblance to the model - the figure need not be perfect but it must be recognizable as the figure which the child attempted to copy. A score of two is given for an attempt which duplicates the figure in all its essential characteristics.

A copy of the test and administrative instructions are presented in Appendix 3.

4. Visual Short-Term Memory (STMV)

This test was used as a basic measure of Jensen's Level I ability. Digits have been the most widely used stimulus material in studying rote serial learning. In the current investigation, digits were presented in a simple matrix projected onto a screen by a slide projector. Each matrix has 5 digits presented at once. Figure III is a sample item as seen by the subjects. The subject was asked to look at the matrix for 5 seconds, after which it disappeared from the screen. Responses were then written on empty sheets resembling the matrix. Twenty sets of 5 digits were presented. Scoring consisted of tabulating the number of digits correctly placed in each square. The instructions for STMV and the digits are presented in Appendix 4.

5. Auditory Short-Term Memory (STMA)

The test used to measure auditory short-term memory was adopted from Baddeley (1966) who presented housewives with a series of five words which the adult subjects were required to recall immediately by writing the sequence on a sheet of paper. He used two groups of subjects. One group of subjects in condition A received twenty-four sequences of words; twelve

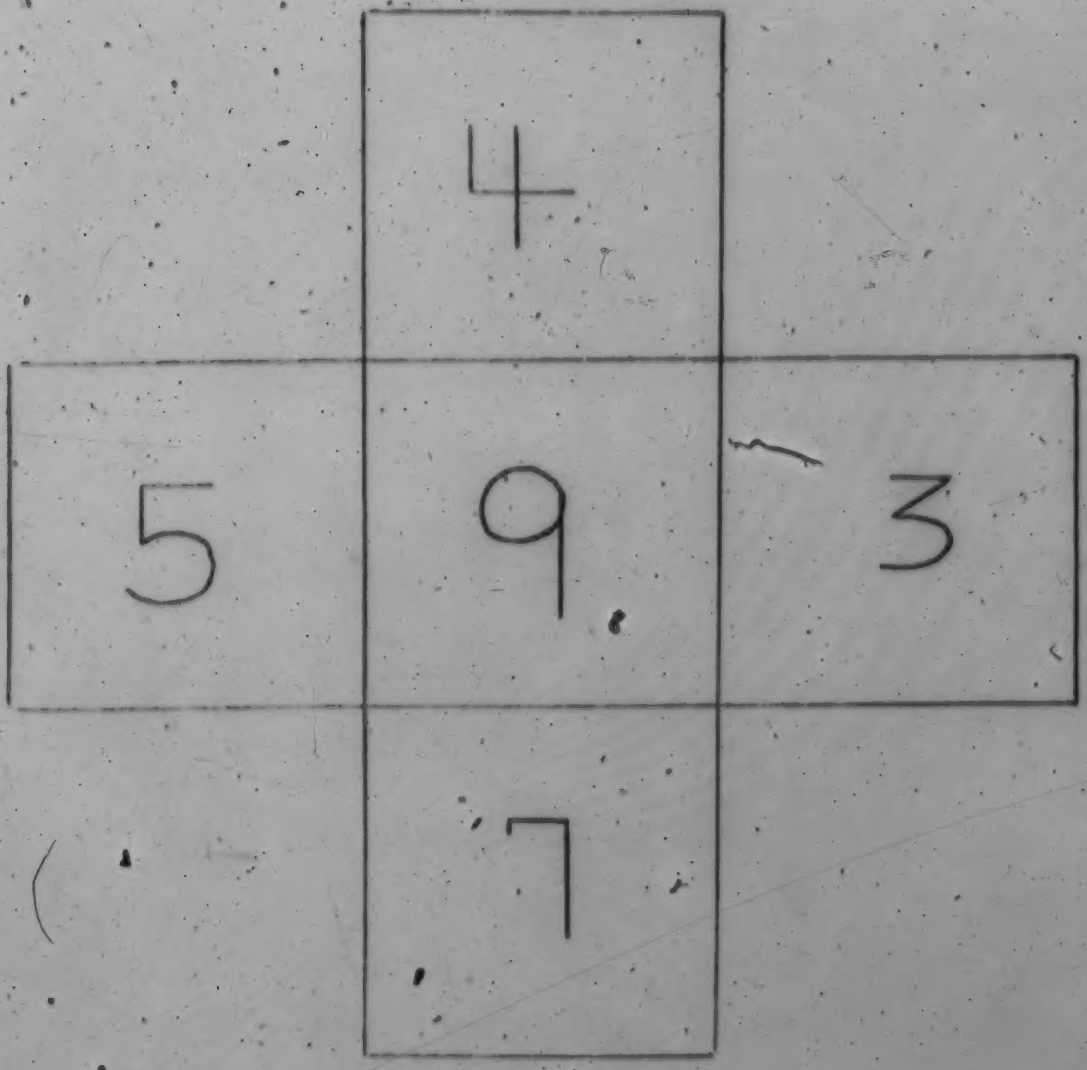

FIGURE 3

A SAMPLE STIMULUS MATRIX USED IN THE STMV TEST

sequences were acoustically similar in sound, twelve sequences were different in sound. The other group of subjects in condition B also received twenty-four sequences; twleve which had words of similar meaning, twelve control words with different meanings. All the sequences were drawn at random from four groups of eight words, one list of words for each condition, with the constraint that a word could not appear twice in any sequence.

A similar procedure to Baddeley's was used in the current investigation but with modification for age difference since Baddeley used adults. The words chosen were all within the normal vocabulary range of grade 4 students. To ensure that each subject knew each of the words, he was asked to define each word before the experimental task. The words from which the sequence were randomly drawn are included in Appendix 5 along with the random order of the word sequence and list presentation. Administrative instructions for the test also appear in Appendix 5.

The method of recall was spoken rather than written because the act of writing could possibly reduce retention. Responses were recorded on a tape recorder for later scoring. The method of scoring consisted of counting as correct only those words that appeared in the same serial position as the stimulus word.

6. Raven's Colored Progressive Matrices (RCPM)

This test was used as a basic measure of Jensen's Level II ability. The test was developed in 1938 as a culture-fair test and consists of a series

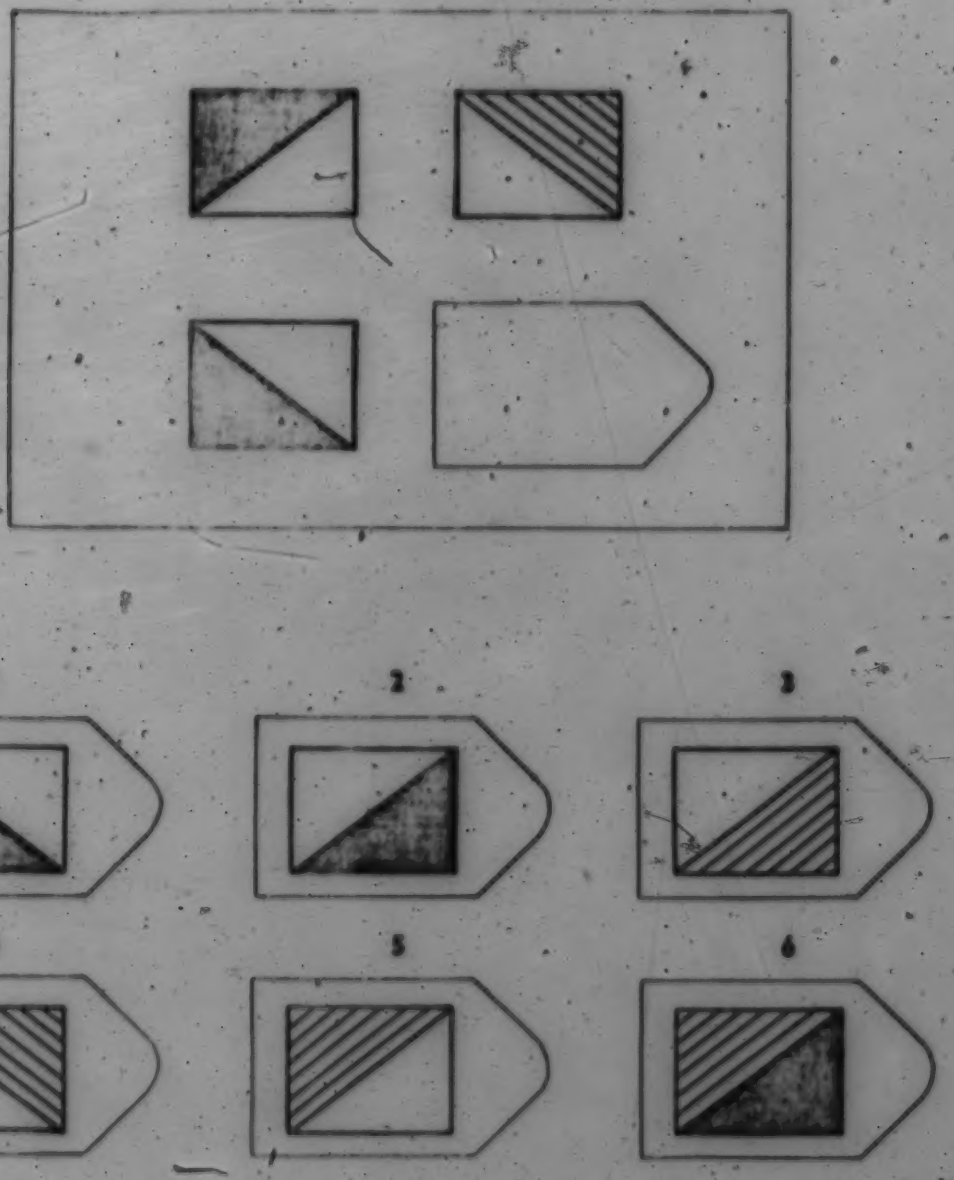

FIGURE 4

A SAMPLE ITEM FROM THE RAVEN'S COLORED PROGRESSIVE MATRICES (RCPM)

of colored patterns, each with a missing piece. An example of the RCPM is shown in Figure 4. The subject is to choose the piece that finishes the pattern from alternatives presented. The test is non-verbal in that reading or language is not tested directly. It was devised to load heavily on the g factor, in the Spearman sense. According to the manual, the test's reliability is close to .90. The correlation between the RCPM and other intelligence tests is quite high. For 70 children, ages 9-2 to 10-1, the correlation with the Wechsler Intelligence Scale for Children (WISC) was .75 for the total score, .69 for the verbal score, and .70 for the performance score (Barratt, 1956).

The RCPM is divided into three subgroups each containing 12 items, each item becoming progressively more complex. The total maximum score is 36.

The administrative instructions for the RCPM are presented in Appendix 6.

7. Cross-Modal Coding (CMC)

This task was adapted from Cravioto, Caona and Birch (1967). They have used it on rural Mexican children who were suspected to have cognitive deficit due to malnutrition. The task consists of asking the child to listen to a pattern of pencil taps on a table, and recognise the pattern visually. In the visual form, the temporal separation is represented spatially.

Although there is little agreement on the nature and number of specific cognitive skills which differentiate the average from the culturally deprived

child, almost all available research agrees that these children typically differ in information processing. This includes three stages - encoding, storage and retrieval of information. O'Connor and Hermelin (1963) found that the culturally-deprived child is deficient in cross-modal coding - transformation and recall of information in one mode (e.g., visual) when the stimuli have been presented in a different mode (e.g., auditory).

In the current study, a standardized testing procedure was accomplished by tape recording the taps so that all that the examiner had to do was to turn on the tape recorder and present visual stimuli which were on cards at the proper time. A total of thirty auditory patterns were presented to each subject and the position of the correct response on the recognition stimuli card was randomly assigned to each of the thirty test items. The auditory and visual stimuli are shown in Figure V.

Scoring for CNC consists of totalling the correct number of responses, giving a maximum score of 30. Administrative instructions are presented in Appendix 7.

8. Index of Educational Environment Scale (I.E.E.)

Utilizing the work of Wolf (1966), Dyer (1967) devised a modification of his scale to produce an Index of Educational Environment in the home (I.E.E.) to test a sample of Jamaican families. Like Wolf, he found it much more predictive of a child's school achievement than socioeconomic status.

In the current investigation, Dyer's questionnaire was used as a basis

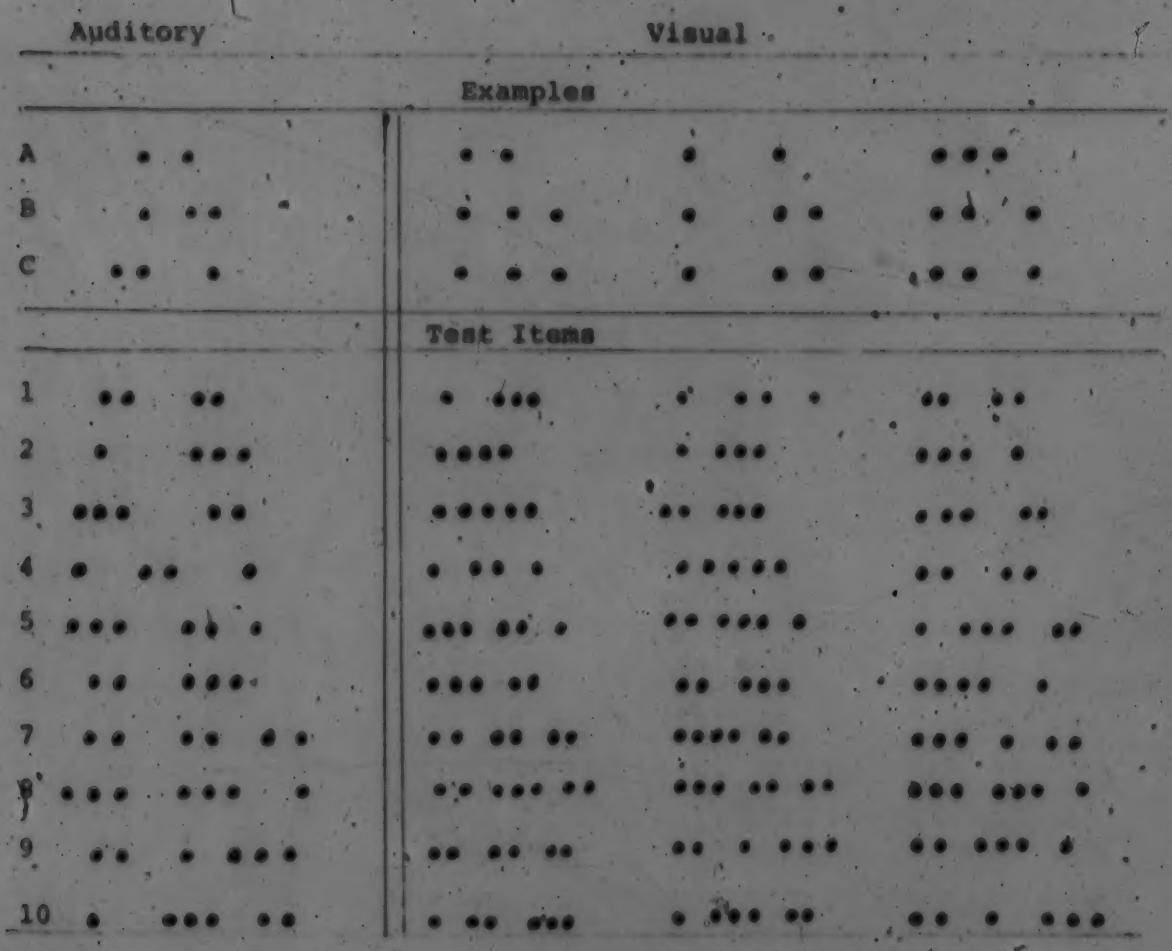

FIGURE 5

AUDITORY AND VISUAL TEST STIMULI FOR THE CMC TEST. LARGE AND SMALL SPACES REPRESENT APPROXIMATE TIME INTERVALS OF 1.35 SEC. AND .35 SECS., RESPECTIVELY.

for an interview arranged with the parents of the two sample groups. The interview took the form of an informal discussion on education during which time answers to the questionnaire were elicited. This method was thought better than simply reading out the questions to the parents as it puts them more at ease and increases the reliability of the information. The interviews were taped so that scoring would not have to take place during the interview. The questionnaire and scoring procedure are presented in Appendix B.

The environmental processes measured by the I.B.E. are (1) interest in the child's academic achievement, (2) knowledge of child's educational progress, (3) parental aspirations for the education of the child, and (4) parental preparation for higher education of the child.

9. Internal and External Locus of Control Scale (I-E)

The I-E scale for adults as devised by Rotter (1966) has been briefly discussed earlier in this chapter during the description of the IAR scale for children. The scale is a 29-item, forced choice test including six filler items intended to make somewhat more ambiguous the purpose of the test. Unlike the IAR scale, it does not look at the negative and positive internal scores but rather measures the internal-external scores regardless of whether the choices imply success or failure. The norms are given in terms of a person's external score and thus scoring is the total number of external choices. The I-E scale and instructions for administration are presented in

Appendix 9.

Test-retest reliability of 60 mixed University students after one month was .72 (Rotter, 1966).

EXPERIMENTAL HYPOTHESES

The experimental hypotheses for this study centre around Jensen's model of intelligence as it pertains to different SES groups: Jensen's basic assumption of the non-significant effect of environmental variables on I.Q. and achievement was challenged and tested against his two level theory of intelligence.

The following hypotheses were tested:

1. There will be no difference in Level I ability between the low and high SES groups.

Jensen identifies Level I ability as associative learning and is best measured by digit span and rote serial learning. Most tests comparing low and middle SES groups on memory tasks have found no significant difference between the two groups. In this study the two experimental groups were tested on digit span (short-term memory visual) and rote serial learning (short-term memory auditory). One-way analysis of variance was used to determine statistical significance between the two groups.

2. The high SES group will score significantly higher on Level II ability than the low SES group.

Jensen identifies Level II ability as abstract reasoning and is best

measured by tests such as the Raven's Progressive Matrices and the Figure Copying Test. Jensen postulates that the difference between the two groups in Level II ability has a predominant genetic base; others contend that it is the result of environment or an interaction between the two. The Raven's Colored Progressive Matrices Test, the Figure Copying Test, the Lorge-Thorndike I.Q. Test, and the Math and Reading Achievement Tests were used as different measures of Level II ability. Differences between the two groups on these tests were measured by a one-way analysis of variance.

3. The greater the amount of abstract reasoning ability required on a given test, the greater will be the difference between the two groups.

This hypothesis is based partly on the first two hypotheses. A test containing items requiring pure memory work will show no difference in results between the two groups, but as the test items become less related to the memory of certain facts and more related to reasoning ability, distinctions begin to increase between the two groups.

Jensen (1970) states that "the one characteristic that distinguished most between items showing a large social class difference in the probability of giving the right answer was the degree of abstractness of the test item. This attribute of test items is a more important factor in determining disparity of test scores between upper and lower classes than the factor of cultural content per se"(p.105).

Good performance on tests such as the Ravens and the Figure Copying Test require no memory skills per se - they require pure abstract reasoning ability. On the other hand, tests such as the Lorge-Thorndike and Achievement

tests contain a number of items requiring recall of various facts and principles. If Jensen is correct, there should be a greater difference between the two groups on the Ravens and the Figure Copying Test than on the Lorge-Thorndike and the Achievement tests.

4. There will be a significant positive correlation within each group between the Index of Educational Environment and Level II ability.

5. There will be a significant positive correlation within each group between the Intellectual Achievement Responsibility Test and Level II ability.

Hypotheses 4 and 5 are based on research suggesting that a student's home environment has a significant influence on Level II ability. The I.E.E. is a much more detailed measure of this environment than socioeconomic status. Also, a student's sense of powerlessness as measured by the IAR should affect performance on Level II tests. These last two hypotheses are in contrast to Jensen's assumption that environmental conditions and/or personality characteristics have little or no influence on intellectual ability as measured by I.Q. and achievement tests. Pearson Product-Movement Correlations were used to find the correlations between the variables.

As this chapter indicates, the purpose of this study is to determine to what extent, if any, the cognitive abilities described in this chapter differ between low and high SES students. More importantly, if differences do indeed occur, to what extent are these differences due to inherent factors contained within the tests themselves, environmental conditions, personality factors, or a combination of the three.

CHAPTER IV

RESULTS AND DISCUSSION

ONE WAY ANALYSIS OF VARIANCE OF COGNITIVE TESTS

The means, standard deviations and range of scores for each test, along with the level of significance at which the mean scores of the two groups differ are presented in Table 3. Statistical significance was set at $P = .05$.

Statistically significant results between the two groups were found on four of the eight cognitive tasks administered. These tests were the Ravens Colored Progressive Matrices, Lorge-Thorndike I.Q., and the Math and Reading Achievement tests. The Ravens was significantly different at the .04 level and the other three tests were significantly different beyond the .005 level. The differences in results between the two groups were all in favour of the high SES group.

No significant difference between the two groups was found on the remaining four cognitive tasks. These tasks included the two short-term memory tests, the Cross-Modal Coding test and the Figure Copying test.

The first three hypotheses of this study are based on the results of the one-way analysis of the cognitive tests and will now be discussed in terms of these results.

TABLE 3

SUMMARY RESULTS OF COGNITIVE TESTS

	Low SES			High SES			One-way analysis of variance	
Test	Mean	S. D.	Range	Mean	S. D.	Range	F	P
STMV	90.90	11.71	50-100	91.97	12.97	42-100	0.11	.74
STMA	69.21	19.32	16-96	76.04	13.53	36-96	1.98	.16
CMC	26.73	3.56	17-30	27.30	3.49	15-30	0.37	.54
Lorge-Thorndike I.Q.	94.86	14.74	70-130	107.26	11.57	82-132	9.23	.003**
Ravens	26.60	4.79	14-33	29.37	5.05	14-35	4.59	.04*
Figure Copying	16.17	1.39	14-19	16.83	1.93	14-20	2.27	.14
Math Achievement	62.23	16.86	33-94	74.43	15.87	41-98	8.32	.005**
Reading Achievement	61.53	18.17	26-97	74.36	12.25	46-93	10.28	.002**

* significance < .05

** significance < .01

First Hypothesis

This hypothesis states that there will be no significant difference in Level I ability between the low and high SES groups.

Level I ability is identified by Jensen as associative learning or memory ability and is represented in this study by the short-term memory verbal (STMV) and short-term memory auditory (STMA) tests. Results of the analysis of variance indicate no significant difference between the means of the two groups on both tests, therefore the hypothesis is accepted. The majority of studies comparing the results of memory tests between different SES and age groups have produced similar findings.

Cross-modal coding can also be viewed from a short-term memory framework. Basically, the task is the same as most typical short-term memory tasks with the exception that the response modality is quite different from the input modality. The CMC task in the current investigation is considered to be similar to the other short-term memory tasks. No significant difference between the two groups was found on this test.

Second Hypothesis

This hypothesis states that the high SES group will score significantly higher on Level II ability than the low SES group.

Level II ability is identified by Jensen as abstract reasoning ability. It must be remembered that although Jensen categorizes all cognitive functions

into two major groups, some tests will be better indicators of Level II ability than others. Indeed, Jensen acknowledges that all tests fall along a continuum ranging from pure memory ability to pure abstract reasoning ability. Figure 6 illustrates the probable position of the cognitive tests used in this study ranging from Level I to Level II.

The tests used to measure Level II ability in this study were the Ravens Progressive Matrices, the Figure Copying, the Lorge-Thorndike I.Q., and the Math and Reading Achievement tests. Jensen considers the Ravens to be a purer measure of abstract reasoning than the standard I.Q. and achievement tests. He also considers the Figure Copying test to be an accurate measure of abstract reasoning and a valid measure of cognitive development (Jensen, 1970).

The results of the analysis of variance indicate a significant difference between the two groups on the Ravens, the Lorge-Thorndike, and the Math and Reading Achievement tests. No significant difference was found between the two groups on the Figure Copying test.

The results of the Figure Copying test present difficulties in completely accepting the hypothesis that high SES students score significantly higher on Level II ability than low SES students. A close examination of the Figure Copying test results rules out any possibility of a ceiling effect. The resultant means and distribution of scores are consistent with those found by Ilg and Ames (1964) for a similar age group. The majority of age 10 boys are able to complete the first eight figures but only 46% complete figure 9 and only 20% complete figure 10. The ability to succeed on a more

difficult item in the age scale is not functionally dependent upon success on previous items in the sense that the easier item is a prerequisite component of the more difficult item. The age differential for such tasks found on the Figure Copying test is so marked as to suggest that they depend upon the sequential maturation of hierarchial neural processes (Jensen, 1970).

It would appear that acceptance or rejection of the hypothesis is contingent upon the test or tests used to measure abstract reasoning ability.

Third Hypothesis

This hypothesis states that the greater the amount of abstract reasoning ability required on a test, the greater will be the difference between the two groups.

Jensen (1969) claims that low SES children do worse on those tests requiring complex abstract reasoning ability such as the Ravens and Figure Copying tests than on the regularly used I.Q. and achievement tests which measure a variety of conceptual skills including rote memory. In other words, the more abstract reasoning ability required, the greater the difference between the low and high SES groups.

In the present study, a comparison of the results of the analysis of variance of the Level II tests show that the greatest differences between the two groups occur on the Reading Achievement test ($P = .002$), the Lorge-Thorndike I.Q. test ($P = .003$), and the Math Achievement test ($P = .005$). This gap in mean scores between the two groups narrows on the Ravens ($P = .04$)

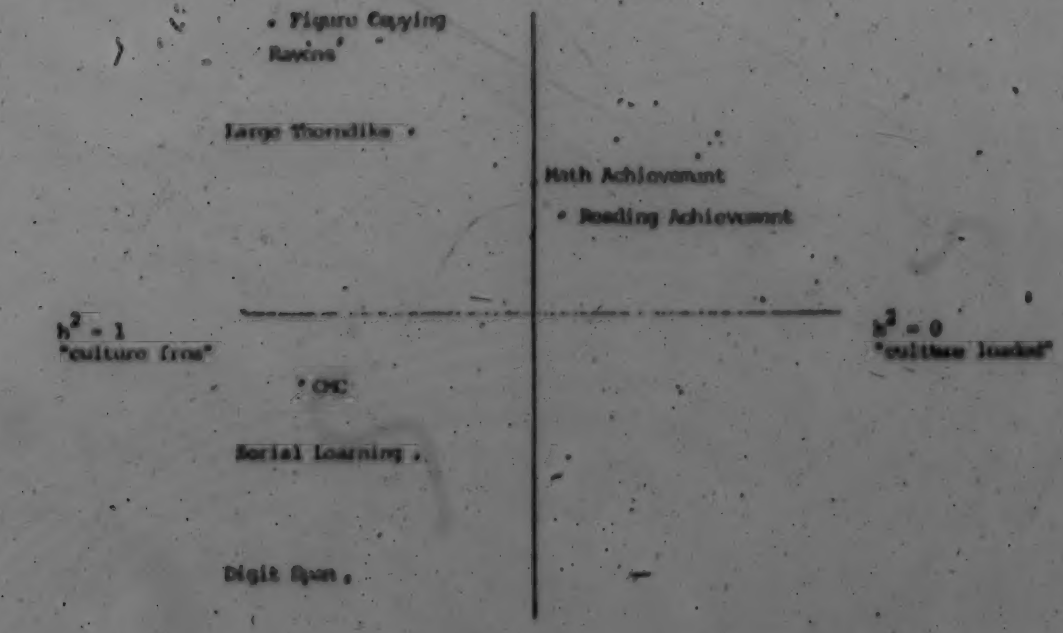

FIGURE 6

THE PREDICTED POSITIONS OF THE COGNITIVE TESTS IN RELATION TO LEVEL I AND II ABILITIES

and is completely eliminated when the results of the Figure Copying test are compared. This narrowing of test scores between the two groups as the test reached a purer form of abstract reasoning ability is the complete reverse of what Jensen postulates. Therefore the hypothesis is rejected.

Both Vernon (1973) and McIlloy (1973) lend support to the rejection of the hypothesis. Vernon found no difference between grade 5 low and high SES boys on the Ravens and McIlloy also found no difference between low and high SES boys on the Ravens but did find a significant difference between the two groups on the PPVT which is considered a less accurate measure of abstract reasoning ability than the Ravens.

These results have important implications regarding Jensen's theory of intelligence, since what is brought into question is not that tests and skills vary along a continuum ranging from associative learning tasks to conceptual learning, but the assumption that differences in results of such tests between low and high SES children are due to the level of abstract reasoning ability required.

Since this assumption is seriously disputed, other factors accounting for the differences between low and high SES groups on traditional I.Q. and achievement tests must be considered. If we were to accept Jensen's claim that test items on traditional I.Q. and achievement tests are not culturally biased, how are we to explain the much larger differences found on the Lorge-Thorndike I.Q. and Math and Reading Achievement tests than on the Ravens and Figure Copying tests. Besides the content, the form of a test should also be considered in terms of a cultural bias. That is: to what extent, if any, does

the actual structure and presentation of a test favour one group over another. Cole and Bruner (1971) essentially make the same observation by reminding one "that the most important thing about any 'underlying competence' is the nature of the situation in which it expresses itself" (p. 784). Extensive research has been done analysing the content of tests but much less research has been done on the subtle, yet possibly profound effects of the specific forms of much of the material, other than verbal versus non-verbal.

Analysing I.Q. and achievement tests in this context, we find that the traditional school tests such as the ones used in this study produce a large difference in mean scores between low and high SES students. As a test becomes less structured in the traditional mold, the gap between the mean scores of the two groups closes. Thus, the Ravens produces a smaller mean difference than the Lorge-Thorndike and the achievement tests. It is quite possible that the Ravens succeeds in presenting a testing situation requiring abstract reasoning ability that has little commonality with traditional middle class school tests and thus is a less biased testing situation experience for both groups. Exploring this idea further the Figure Copying test results show no difference between the two groups. Jensen recognizes this test as a valid measure of Level II ability but more importantly, the format of the test is extremely different in that students are required to copy various geometric designs. In fact, my experiences observing students taking this test was such that they did not perceive the task as a testing situation.

The possibility of a bias in both the content and form of a test, as

suggested in this study, may also help explain the seemingly conflicting evidence of a schooling effect on various test results. Molloy (1973) found much larger differences in mean scores between low and high SES boys at the grade 4 level than at the grade 1 level on the highly verbal PPVT test, but got just the opposite effect on the non-verbal Ravens using the same sample. Studies using traditional I.Q. and achievement tests have overwhelmingly shown a negative effect between the number of years of schooling and I.Q. and achievement, but studies using the Ravens (Bruner et al., 1966; Schmidt, 1966; Vernon, 1973) have indicated a positive effect. In other words, schooling has a negdtive effect on low SES students if typical middle class standards of success is the only criterion used, as is the case in the majority of public schools.

ONE WAY ANALYSIS OF VARIANCE OF NON-COGNITIVE TESTS

The means, standard deviations and range of scores for each test, along with the level of significance at which the mean scores of the two groups differ, are presented in Table 4. Statistical significance was set at P = .05.

Making X's Test

No significant difference between the two groups was found on the Making X's test. These results are consistent with results found by Jensen (1969) for a similar group of grade 4 boys. The test gives an indication of the

group's willingness to comply with instructions in a group testing situation and to mobilize effort in following those instructions.

Intellectual Achievement Responsibility Test (IAR)

No significant difference between the two groups was found on the IAR test. This test was designed to assess students' beliefs in reinforcement responsibility in intellectual academic achievement situations. Crandall et al. (1964) found that low SES children tend to be more external in their beliefs than high SES children. That is, low SES students place responsibility for their successes and failures more on external forces over which they feel they have no control. The reason why no difference was found between the two groups in the present study is probably due to the fact that the two groups shared the same classroom environment. Coleman (1966) found that, in general, low SES students are more external than high SES students; however, if low SES students are placed in schools with high SES students they score as high as the high SES students on the internal scale.

Internal and External Locus of Control Scale (I-E)

No significant difference between the parents of the two experimental groups was found on the I-E scale. Previous studies dealing with adults on the I-E scale have produced conflicting results. Crandall (1963) and Crandall et al. (1964) found that low SES adults placed more responsibility

TABLE 4

SUMMARY RESULTS OF NON-COGNITIVE TESTS

	Low SES			High SES			One Way analysis of variance	
Test	Mean	S.D.	Range	Mean	S. D.	Range	F	P
Making X's	19.97	13.71	0-49	23.63	17.15	0-62	0.87	.37
IAR I+	12.06	2.79	6-17	12.43	2.73	5-16	-	-
I-	9.90	2.39	5-15	9.66	3.32	1-16	-	-
I total	21.96	3.81	15-31	22.10	4.45	13-32	0.02	.90
E-I	8.77	4.01	2-16	7.63	3.28	2-14	1.39	.24
I.E.E.	15.63	7.37	5-30	24.23	5.27	10-33	26.11	.001**

** significance < .01

for what happens to them on external factors than high SES adults. On the other hand, a study done by Crowne and Conn (1965) found no difference between low and high SES adults. No reason was given to explain the results. One possible explanation for the present results may be the fact that both experimental groups have access to, and participate in, common community activities.

Index of Educational Environment Scale (I.E.E.)

The results of the I.E.E. show a much higher mean score for the high SES sample with a significant difference beyond the .001 level. This would indicate that in terms of home environment the high SES students find themselves in a much more positive and understanding atmosphere regarding their role in education. Possibly more important, as the interviews revealed, is the underlying assumption that the future will automatically include a university education leading to a "white collar" profession. On the other hand, parents of low SES children, although expressing interest in, and a need for, their children's education, were not as knowledgeable about what their children were doing academically in school and had much lower aspirations for the education and ultimate vocation of their children.

INTER-CORRELATIONS OF TESTS

Inter-correlations of the tests for the two groups were computed to

investigate Jensen's findings of the relationship between Level I and II abilities as discussed in Chapter II. Possible relationships between the environmental variables and the cognitive tasks were also analysed.

The analysis was done by computer using the Pearson product-moment formula. Table 5 contains the inter-correlations for the low SES group and Table 6 contains the inter-correlations for the high SES group. Correlation co-efficients equal to or greater than .36 are significant at the .05 level (Ferguson, 1966).

Correlation of Level II Abilities

In the high SES group, correlations among the three measures of abstract reasoning ability - Lorge-Thorndike I.Q., Ravens and Figure Copying tests - all correlated at a significant level with each other. The Lorge-Thorndike and Ravens produced a r = .59; Lorge-Thorndike and Figure Copying, r = .45; and Ravens and Figure Copying, r = .49. These r's were all within the range of previous findings for high SES groups.

In the low SES group none of the three measures of abstract reasoning ability correlated significantly with each other. It would appear that the inherent differences in the content and/or form of the various abstract reasoning ability tests has a much greater effect on low SES students such that the results on one test have no bearing on another. Indeed, this was the case when the mean scores of the tests were analysed earlier in this Chapter. One obviously inherent factor accounting for these results is the high verbal

Table 5

Inter-Correlation of Tests for Low SES Group

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Lorge-Thorndike	1.00														
2. SES	.25	1.00													
3. I.E.E.	.55	.56	1.00												
4. E-I	-.24	-.24	-.37	1.00											
5. I+	.09	-.05	.07	-.38	1.00										
6. I-	-.21	.07	-.16	-.24	.08	1.00									
7. I Total	-.07	.01	-.04	.42	.78	.69	1.00								
8. Raven's	.16	-.18	.22	-.01	.01	.14	.16	1.00							
9. Figure Copying	.09	-.17	.11	.12	-.15	.06	-.08	.34	1.00						
10. CMC	.38	-.12	.10	.06	.09	-.11	.00	.38	-.15	1.00					
11. X's	.06	-.03	.24	-.27	.08	-.17	-.05	.08	.14	-.20	1.00				
12. STMV	.52	.34	.29	-.21	.07	-.12	-.03	.08	.13	.13	-.03	1.00			
13. STMA	.67	.31	.32	-.13	.23	-.07	.12	.25	-.01	.40	.02	.77	1.00		
14. Reading Ach.	.61	.08	.45	-.05	.14	-.28	-.08	.49	.15	.33	.30	.26	.49	1.00	
15. Math Ach.	.75	.15	.63	-.21	-.01	-.13	-.09	.35	.19	.28	.28	.37	.46	.74	1.00

Table 6

Inter-Correlation of Tests for High SES Group

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Lorge-Thorndike	1.00														
2. SES	.30	1.00													
3. I.E.E.	.44	.25	1.00												
4. E-I	.14	-.12	.03	1.00											
5. I+	-.04	-.09	-.17	-.18	1.00										
6. I-	.28	.50	.36	-.14	.07	1.00									
7. I Total	.18	.32	.16	-.22	.67	.79	1.00								
8. Raven's	.59	.35	.46	.08	-.05	.45	.31	1.00							
9. Figure Copying	.45	.33	.25	.22	-.22	.42	.18	.49	1.00						
10. CMC	.37	.02	.39	.16	-.04	.48	.34	.31	.42	1.00					
11. X's	-.04	.00	-.06	-.14	-.09	-.21	-.21	-.12	.04	-.22	1.00				
12. STMV	.26	.18	.22	.25	-.14	.17	.04	.18	.36	.65	.10	1.00			
13. STMA	.30	.15	.25	.22	-.10	.39	.23	.36	.45	.44	.21	.64	1.00		
14. Reading Ach.	.64	.00	.38	.27	-.11	.02	-.05	.19	.13	.24	.32	.43	.44	1.00	
15. Math Ach.	.78	.21	.40	.24	-.18	.39	.18	.52	.41	.39	-.07	.30	.30	.58	1.00

content in the Lorge-Thorndike I.Q. test. The low SES group scored significantly lower than the high SES group on the Reading Achievement test, confirming numerous other studes that low SES students are not as proficient in reading as high SES students. The verbal content of the Lorge-Thorndike test would act as a hinderance in assessing abstract reasoning ability in low SES students, whereas tests such as the Ravens and Figure Copying test would at least eliminate the reading factor. On the other hand, the high SES students are more proficient in reading so a higher correlation between the Lorge-Thorndike and the Ravens or Figure Copying tests would be expected and is indeed the case.

Eliminating the verbal factor however does not solve the whole problem. The correlation between the two non-verbal tests, the Ravens and Figure Copying test is still only .34 for the low SES group. Since no significant difference between the two groups was found on the mean scores of the Figure Copying test we can assume that the Figure Copying test has managed to eliminate any factors in its construction which might discriminate between the two experimental groups used in this study. The fact that the test is not perceived as a test by the subjects may be one of those factors.

What the results of the correlations seem to suggest, and the results of the analysis of variance of the abstract reasoning ability tests tend to support, is that when various tests are used to measure abstract reasoning ability, some tests reveal significant discrepancies between two different cultural groups, others do not. It is quite possible that these discrepancies are due to inherent factors in the actual tests rather than a deficit of

abstract reasoning ability in one of the groups.

Correlation of Level I Ability on Level II Ability

Jensen (1970) postulates a hierarchical organization of Levels I and II. That is, good Level I ability is a necessary though not a sufficient condition for the growth of Level II. This would imply very few students who would be poor in Level I but good in Level II ability. This would also mean that the correlation between Levels I and II would be higher in the high SES group than in the low SES group. The present results, although indicating slightly higher correlations for the high SES group, are not as significant as those found by Jensen who has obtained correlations of .60 and over for high SES students and .20 and under for low SES students. Rather, the correlations of Level I ability on the Ravens of .36 for the high SES group and .26 for the low SES group found in this study are closer to those found by Vernon (1973) who found regression coefficients of associative tests on "g" at .43 and .30 in the high and low SES groups respectively. Some doubt therefore exists about the functional dependence of Level II on prior Level I.

Correlations of Making X's Test on Cognitive Abilities

No significant correlations were found in either of the experimental groups between the Making X's test and tests requiring rote memory or abstract reasoning ability. The Making X's test measures motivation in terms of speed

and persistence in a test taking situation (Jensen, 1970). The results of the tests show a wide range of scores within each group and one would expect that this motivational factor would have a significant correlation with some of the various cognitive tasks. Perhaps the menial task of making x's is too far removed from the actual skills required in the cognitive tasks and is thus not an accurate measure of speed and persistence in terms of these tasks.

Correlations of the Intellectual Achievement Responsibility Test on Cognitive Abilities

In the high SES group there were some medium correlations between the IAR test and some of the cognitive abilities. Specifically, the internal negative score correlated significantly with the Ravens (.45), STMV (.39), Math Achievement (.39), and the Figure Copying Test (.42). The internal negative scores had a greater relationship than the internal positive with the various tasks. The results suggest that assuming responsibility for one's own failures has a more positive effect on future success academically than assuming responsibility for one's successes. This substantiates the work of several researchers, such as Crandall (1963) and Crandall et al. (1964), who found negative social reinforcement to be more effective than positive reinforcement. It may possibly be that the greater impact of the failure produces a more durable effect on the internal-external responsibility beliefs surrounding these experiences.

In the low SES group, although their correlation on the internal negative scores were also higher than their internal positive scores, none of the

correlations reached the level of significance. It would appear that low SES students, although they may accept responsibility for their success and failures academically as much as the high SES students, are not sufficiently motivated by this factor to exert an influence on their cognitive abilities. The results of the correlation between the IAR and Level II ability relate specifically to the fifth hypothesis of this thesis and will be discussed in more detail later in this chapter.

Correlations of the Index of Educational Environment on Cognitive Abilities

No significant correlations were found between the I.E.E. and Level I ability as measured by the short-term memory tests in both experimental groups. These results are consistent with most research dealing with the relationship between students' environmental background and rote memory ability.

In the low SES group, the I.E.E. correlates significantly with those Level II tests which tend to produce the widest gap between the two groups, that is, the Lorge-Thorndike I.Q. (.55), the Math Achievement (.63), and the Reading Achievement (.45). No significant correlation was found in this group between the I.E.E. and the Ravens or Figure Copying tests.

The correlations between the I.E.E. and Level II tests in the high SES group, although not large, do reach significance on all the tests with the exception of the Figure Copying test.

The results of the correlations between the I.E.E. and Level II ability relate specifically to the fourth hypothesis of this thesis and will be discussed in detail later in this chapter.

MULTIPLE CORRELATIONS OF TESTS

In the previous chapter on the review of the literature, several studies (Wolf, 1966; Dyer, 1967; Mercer, 1972) were cited which seem to indicate that differences within SES groups were better predictors of intelligence and achievement tests than the actual measure of SES. For this reason, the I.E.E. scale was combined with the SES measure along with the subject's ratings on the locus of control scale in a Multiple Regression analysis to examine the amount of variance these three variables, independently and combined, contributed to intelligence test scores and to the Reading and Math Achievement Tests. A computer program using a Stepwise Regression Procedure (Draper, 1966) was utilised for this purpose. This procedure involves the re-examination at every stage of the regression of the variables incorporated into the model in previous stages. A variable which may have been the best single variable to enter at an early stage may, at a later stage, be superfluous because of the relationships between it and other variables now in the regression. To check on this, the partial F criterion for each variable in the regression at any stage of calculation is evaluated and compared with a pre-selected percentage point of the appropriate F distribution. This provides a judgement on the contribution made by each variable as it had been the most recent variable entered, irrespective of its actual point of entry into the model. Any variable which provides a non-significant contribution is removed from the model. This process is continued until no more variables will be admitted to the equation and no more are rejected.

The three variables, SES, I.E.E., and IAR scale were used to predict the

following four criteria: (1) Ravens, (2) Lorge-Thorndike I.Q., (3) Reading Achievement, and (4) Math Achievement. The data was fitted to the function:

$$Y = B_o + B_1X_1 + B_2X_2 + B_3X_3$$

where Y = criterion score predicted from the weighted linear combination of predictor variables:

B_o = Beta Weights

X_1 = SES

X_2 = I.E.E.

X_3 = IAR

This procedure was repeated seperately for each of the two experimental groups.

Results of Regression Analysis for Low SES Group

The results of the step-wise regression analysis for the low SES group on the Ravens, Lorge-Thorndike I.Q., Reading and Math Achievement are shown in Tables 7, 8, 9, 10.

The total amount of variance accounted for by the three variables on the Ravens is 21.77%. The correlation (-.18) between the Ravens and SES is negative for the low SES group. When the SES is combined with the I.E.E., the SES appears to act as a suppressor variable so that the I.E.E. alone does not contribute significantly but the two combined approach significance at the .06 level and contribute 18.21% of the variance.

The total amount of variance accounted for by the three variables on the

TABLE 7

RESULTS OF STEP-WISE REGRESSION FOR LOW SES GROUP

FOR THE THREE PREDICTOR VARIABLES ON THE RAVENS TEST.

(N = 30)

Predictor Variables	P	P	Beta Weights	% of Variance Accounted for
I.E.E.	.237		0.3107	4.95
SES	.045	.066	-0.0464	18.21
Locus of Control	.286	.089	0.2410	21.77

TABLE 8

RESULTS OF STEP-WISE REGRESSION FOR LOW SES GROUP

FOR THE THREE PREDICTOR VARIABLES ON LORGE-THORNDIKE TEST.

(N = 30)

Predictor Variables	P	P	Beta Weights	% of Variance Accounted for
I.E.E.	.001		1.1754	30.69
SES	.664	.006	-0.0259	31.19
Locus of Control	.799	.018	-0.1613	31.36

TABLE 9

RESULTS OF STEP-WISE REGRESSION FOR LOW SES GROUP

FOR THE THREE PREDICTOR VARIABLES ON READING ACHIEVEMENT TEST

(N = 30)

Predictor Variables	P	p	Beta Weights	% of Variance Accounted for
I.E.E.	.012		1.7207	20.24
SES	.016	.002	-0.1832	35.76
Locus of Control	.798	.008	-0.1934	35.92

TABLE 10

RESULTS OF STEP-WISE REGRESSION FOR LOW SES GROUP

FOR THE THREE PREDICTOR VARIABLES ON MATH ACHIVEMENT TEST

(N = 30)

Predictor Variables	P	p	Beta Weights	% of Variance Accounted for
I.E.E.	.0001		1.7719	39.64
SES	.098	.0002	-0.1042	45.53
Locus of Control	.717	.001	-0.2334	45.81

Lorge-Thorndike is 31.36%. Of this total the I.E.E contributes 30.69%. The other two variables add very little to the total variance.

On the Reading Achievement Test, the total amount of variance accounted for by the three variables is 35.92%. Both the I.E.E. and SES contribute significantly, the I.E.E. accounting for 20.24% and the two combined accounting for 35.76%. The IAR makes little difference in the total percentage. The total amount of variance on the Math Achievement Test is 45.81%, the I.E.E. accounting for 39.64% of the total and the I.E.E. and SES combined account for 45.53%. As in the other cases, the IAR adds very little to the total variance.

Results of Regression Analysis for High SES Group

The results of the step-wise regression analysis for the high SES group on the Ravens, Lorge-Thorndike I.Q., Reading and Math Achievement are shown in Tables 11, 12, 13, 14.

The total amount of variance accounted for by the three variables on the Ravens is 30.22% of this total, the I.E.E contributes 21.52% and the I.E.E. combined with the SES raises the percentage to 27.21%. The IAR adds little to the combined variance.

On the Lorge-Thorndike I.Q., the three variables account for 23.67% of the variance. Of this amount, the I.E.E. contributed the most, accounting for 19.37%.

On the two achievement tests, the amount of variance accounted for by

TABLE 11

RESULTS OF STEP-WISE REGRESSION FOR HIGH SES FOR THE THREE PREDICTOR VARIABLES ON THE RAVENS TEST

(N = 30)

Predictor Variables	P	P	Beta Weights	% of Variance Accounted for
I.E.E.	.009		0.3689	21.52
SES	.157	.013	0.0116	27.21
Locus of Control	.298	.023	0.2119	30.22

TABLE 12

RESULTS OF STEP-WISE REGRESSION FOR HIGH SES GROUP FOR THE THREE PREDICTOR VARIABLES ON LORGE-THORNDIKE TEST

(N = 30)

Predictor Variables	P	P	Beta Weights	% of Variance Accounted for
I.E.E.	.014		0.8267	19.37
SES	.247	.027	0.0257	23.34
Locus of Control	.748	.067	0.1525	23.67

TABLE 13

RESULTS OF STEP-WISE REGRESSION FOR HIGH SES GROUP

FOR THE THREE PREDICTOR VARIABLES ON READING ACHIEVEMENT TEST

(N = 30)

Predictor Variables	F	P	Beta Weights	% of Variance Accounted for
I.E.E.	.075		0.8260	10.81
SES	.552	.178	-0.0101	11.99
Locus of Control	.725	.319	-0.2482	12.41

TABLE 14

RESULTS OF STEP-WISE REGRESSION FOR HIGH SES GROUP

FOR THE THREE PREDICTOR VARIABLES ON MATH ACHIEVEMENT TEST

(N = 30)

Predictor Variables	F	P	Beta Weights	% of Variance Accounted for
I.E.E.	.027		1.0774	16.18
SES	.508	.192	0.0172	17.55
Locus of Control	.633	.148	0.3306	18.28

the three predictor variables is considerably less than that recorded for the low SES group. The amount of variance did not reach significance at any stage of the regression analysis on the reading achievement criterion and accounted for only 12.41%. On the Math Achievement Test, the three variables accounted for 18.28% of the total variance, 16.18% of which was directly related to the I.E.E.

The overall results of the multiple regression analysis indicate that when the three predictor variables, the I.E.E., SES, and IAR, are combined to predict scores on I.Q. and achievement, more than half of the variance accounted for is attributed to the Index of Educational Environment. The one exception to this is the prediction of scores on the Ravens within the low SES group. In this situation the computer program chose the I.E.E. as the most favourable predictor. The correlation between the I.E.E. and the Ravens was only .22, so the amount of variance accounted for by the I.E.E. on the Ravens was only 4.95%. When the second variable was chosen - the SES, which had an inverse correlation of -.18 on the criterion - the multiple correlation of the two predictor variables raised the amount of variance accounted for to 18.21%. Apparently the SES variable was acting as a suppressor variable in this situation so that the two variables; the I.E.E. and SES, must be combined in order to account for maximum variance on the Ravens.

In both groups, the inclusion of the locus of control (IAR) variable added less than 1% to the total variance on the Lorge-Thorndike and achievement tests; after the I.E.E. and SES are accounted for. This amount increased to only 3% of the total variance accounted for on the Ravens.

In the low SES group, prediction of success on the I.Q. tests depends on the type of test used. Results on the Ravens are not predictable, but on the Lorge-Thorndike the I.E.E. can account for 30% of the variance. The other two variables add very little to this amount. In the high SES group, prediction is possible for both types of tests. On the Ravens, the I.E.E. accounts for 21% of the variance and this is raised to 27% when SES is added. On the Lorge-Thorndike, the I.E.E. accounts for 19% of the variance.

Reading achievement is not predictable for the high SES group and math achievement is only slightly predictable by the I.E.E. However, for the low SES group, both achievements are highly predictable. The I.E.E. accounts for almost 40% of the variance in math achievement and 20% in reading achievement.

These results suggest that home environment has a strong effect on the results of the Reading, Math, and Lorge-Thorndike I.Q. tests for the low SES students but very little effect on the results of the Ravens test. For the high SES group, educational environment at home contributes more to the outcome of the Ravens and Lorge-Thorndike tests than to the Math and Reading Achievement tests.

Fourth Hypothesis

This hypothesis states that there will be a significant positive correlation within each group between the Index of Educational Environment and Level II ability.

The ultimate acceptance or rejection of this particular hypothesis is contingent upon the type of test used to measure Level II ability. Earlier in this chapter it was pointed out that the high SES group produced significantly higher scores on those Level II tests that were highly verbal and tended to reflect the values and mores of middle class society. It is precisely these test results (Lorge-Thorndike I.Q., Math and Reading Achievement, and to a lesser degree the Ravens test) that show a positive relationship with the home educational environment for both groups. On the other hand, the Figure Copying test, which produced similar mean scores for both groups and whose structure and content is far removed from any traditional assessment of a child's abstract reasoning ability, did not indicate any relationship with the home environment.

In terms of predicting success in school, the I.E.E. is a valid measure for both the high and low SES group and in this context, the hypothesis can be accepted. However, in terms of measuring abstract reasoning ability per se, the evidence is not sufficiently conclusive to warrant acceptance of the hypothesis.

Fifth Hypothesis

This hypothesis states that there will be a significant positive correlation within each group between the Intellectual Achievement Responsibility test and Level II ability.

Very little evidence is available in this study to support the hypothesis

for either of the two groups. The high SES group showed a mild correlation between the IAR on the Ravens and Figure Copying tests but none on the Lorge-Thorndike I.Q. test. The low SES group had no significant correlations between the IAR and Level II tests. The regression analysis results tend to support the negation of the hypothesis for when the amount of variance attributed by the home environment on Level II ability is accounted for, the IAR adds less than 3% to the total variance.

It seems likely that the few moderate relationships found in the high SES group between the IAR and Level II ability is a result of the high SES student's ability to accept the blame for those failures which he does experience precisely because his home environment has given him sufficient security to do so.

SUMMARY

Jensen's main hypotheses - that there is no difference in Level I ability between the low and high SES groups, but that high SES children perform better than low SES children on Level II ability - were supported. An exception was that no significant difference was found on the Figure Copying test between the two groups. Jensen's underlying assumptions that the difference in Level II ability is mainly an hereditary one, was challenged. The present results indicate differences in Level II ability between the two groups were not based on the amount of abstract reasoning required within a test but were due to a cultural bias, in both form and content, inherent in

the tests. It was pointed out that the actual selection of a particular test measuring abstract reasoning ability will have a direct bearing on the results for the two groups. The greater a test resembles, in both content and form, the traditional attitudes and mores of middle class society, the greater will be the difference in results between the two groups. Cultural deprivation represents a special case of cultural difference that arises when an individual is faced with demands to perform in a manner inconsistent with his past cultural experience. In the present social context, the great power of the middle class has rendered differences into deficits because middle class behavior is the yardstick of success (Cole and Bruner, 1971). It now becomes quite obvious that when two different SES groups produce significantly different means scores on a test measuring abstract reasoning ability, this result is not necessarily due to the inferior abilities of one group but is quite possibly due to the test's inability to accurately and fairly measure abstract reasoning ability. Keeping this in mind, it becomes more realistic to talk in terms of differences rather than deficits.

The tests of motivation and locus of control revealed no significant difference between the two groups. The Index of Educational Environment indicated that high SES students come from families who are cognisant of what their child is learning and who have aspirations of a professional career for their child. The low SES parents generally were not aware of what was being taught in school and had low aspirations for their child's education and future vocation.

Correlations between Level I and II abilities in both groups were not

substantial and as such do not lend support to the notion of a functional dependence between the two abilities. The Index of Educational Environment correlated strongly in both groups with those tests measuring traditional middle class standards of success but was not an accurate predictor of abstract reasoning ability outside those standards as measured by the Figure Copying test.

When the three predictor variables, the Index of Educational Environment (I.E.E.), SES, and the students' locus of control (IAR) were combined to predict scores on I.Q. and achievement, more than half of the variance accounted for was attributable to the I.E.E. The measure of SES added substantially but the IAR had a negligible effect.

CHAPTER V

CONCLUSION

In the current jargon of the social sciences, the poor are frequently identified by various euphemisms such as "disadvantaged", "underprivileged" and "socially handicapped". In fact, federal agencies in the United States have instructed their staffs to avoid the four-letter word and use "low-income group" instead. Perhaps the most sweeping of these labels is the designation of poor people as "culturally deprived".

The substitution of "culturally deprived" for "poor" is not a simple shift in terminology for identical phenomena. It represents a significant shift in outlook. Traditionally, poverty was measured primarily in terms of objective, concrete conditions of life: income, housing, nutrition, medical care. The concept of "cultural deprivation" places the emphasis on the psychological characteristics of the poor individual himself - his language use, perceptual level, cognitive style, emotional attributes. Poverty nowadays is often discussed as if it were a personal trait rather than a social condition.

This shift has important consequences. It means a redirection of concern, from overcoming the objective circumstances of poverty to altering the attributes of people who are poor.

Implicit in the concept of "cultural deprivation" has been the assumption that the standards of the dominant white middle class culture represent norms by which all other cultures may be appropriately measured. Deviations from

the ethnocentric norm are viewed as deprivations. It is taken for granted that cultural departures from the middle class model mean cultural deficits. Instead of understanding differences in language or behavioral style as reflecting adaptations that may be appropriate to the child's environment, such differences are dogmatically rated according to their approximation of the middle class model. The closer to this model, the smaller the deficit; the further from this model, the larger the deficit.

Kenneth Clask (1965) underscores this point in discussing what he calls "the cult of 'cultural inferiority'". He writes:

> Just as those who proposed the earlier racial inferiority theories were invariably members of the dominant racial groups who presumed themselves and their groups to be superior, those who at present propose the cultural deprivation theory are, in fact, members of the priviledged group who inevitably associate their priviledged status with their own innate intellect and its related educational success. Such association neither proves nor disproves the theory in itself, but the implicit caste and class factors in this controversy cannot and should not be ignored. Many of today's scholars and teachers came from 'culturally deprived' backgrounds. Many of these same individuals, however, when confronted with students whose present economic and social predicament is not unlike their own was, tend to react negatively to them (p. 82).

As one reviews the literature of "cultural deprivation", it becomes clear how pervasive is the premise that the behavior, language, and thought of the poor represent deficits that are not present in the middle class. Differences are automatically labelled deficits, particularly those of a psychological character. But differences between groups do not necessarily mean that one group has a deficit and the other an abundance of the quality at issue. This is pointed up sharply if one examines the differences in the

language of the poor black and the middle class. It is in the area of language that the equation of differences and deficits has perhaps been most prevalent.

A growing body of work (Baratz and Baratz, 1970; Stewart, 1969; Labov, 1969) is challenging the stereotype that lower class black children are verbally destitute and linguistically underdeveloped. The critics point out that an ethnocentric bias lies behind the assumption that linguistic competence is synonymous with the development of standard English. They cite convincing data that lower class black children have a fully ordered, fully structured language, differing from standard English, but not by that token inferior.

If the deficit model holds up poorly with regard to language, it becomes an especially frail foundation for theories about broader behavioral characteristics. Behavior must always be viewed in terms of its adaptive function in a given life setting. Since the conditions of life among the poor are drastically different from those among the middle class, their behavior has to be significantly different. Otherwise, an individual would find it difficult or impossible to function effectively within his own socioeconomic group. When Hunt (1971) and others talk about the poor lacking initiative, motivation, self-control, etc., they are clearly evaluating such attributes according to the way they manifest themselves in middle class adaptations. But the same characteristics appear very differently in youngsters growing up in the slums. Unless one asks oneself "motivation for what purpose, initiative for what goal, self-control in what circumstances?" the categories themselves become abstract and inapplicable in the evaluation of different social groups.

Coles (1967) effectively refutes the deeply rooted notion that children who come from a background of poverty are likely to be emotionally blighted. He describes the resilience and toughness and ingenuity displayed by many such children in the South. "Such children come to school prepared to be active, vigorous, perhaps much more outgoing on the average than middle class children. But they are quick to lose patience, sulk, feel wrong or wronged and cheated by a world they have learned to be impossible uncertain, and contradictory".

Above and beyond such issues, one must also question the presumption and arrogance of the premise that the white middle class way is a desirable one. At this point in history, it hardly needs belaboring that the established middle class mores are not providing a healthy basis for the flourishing of humanistic values.

The preoccupation with psychological deprivation has dulled a concern for those deficits that do plague the life of the poor and urgently require correction - health and nutrition, housing, schools, and job opportunity. Special emphasis should be directed to the issue of health and nutrition, because so much that has been attributed to psychological deprivation has really been due to physiological factors. There seems to be a serious underestimation of the impact of poor health and nutrition on school failure, as Birch and Gussow (1970) point out in their assessment of the effect of poverty on the intellectual potential of children. "The same homes which lack toys and books are the homes in which hunger and disease abound", they observe. The focus on "cognitive understimulation" in such homes all too often beclouds the central and urgent need for adequate food and medical care.

On reviewing the results of the present study it would appear that if what is assessed on I.Q. tests is shown to depend on education (in the broadest sense including cultural assimilation) or to be susceptible to training, the test is thereby a less good measure of innate intelligence. The better the test, the less related are its results to the subjects' environment - by definition. Apart from any other considerations, this theory proves indefensible on practical grounds: the designers of such tests would be forced to conclude that there is no such thing as intelligence, or at least a test of intelligence, since all relevant inquiries have indicated a practice effect in mental tests comparable with that found in the acquisition of many other human skills.

It is common to hear of culture-free tests; to read of investigations which result in ranking different nationalities, of colours, of races, in order of intelligence, to find a rigid distinction drawn between, for instance, 'information' vocabulary tests and innate 'capacity' diagrammatic tests. All these practices presuppose that the nature/nurture dichotomy is valid. Were it possible to devise any tests which were genuinely 'culture fair' their value would probably be exceedingly limited and their results would bear little relation to that which is usually considered intelligent behavior as defined by middle class norms.

A given psychometric assessment of intelligence can and does have some degree of reliability for some persons, notably those for whom it was intended, but its usefulness for some should not be construed as general validity for all. If intelligence is an essentially dynamic process whereby potentials are recognized or left undeveloped, then the acquisition, or at least temporal

expression, of intelligence must occur in a fundamentally ordered but different manner for all persons. These differences which are apparent in, for example, the 15 points discrepancy between the Black-White I.Q. should not be taken to infer deficit, for deficit inherently judges some people inferior. The term difference, as it is used here, is decidedly not an euphemism for inferior. I have no doubt that the incredible degree of cultural homogeneity with, say the U.S., is a necessary exigency for the functioning of a highly technocratic nation. Sub-populations tend to be gradually assimilated, as were the tremendous number of Irish immigrants in 1849, until they approach the mainstream. Numerous reasons exist for the endogeny of other sub-populations, but whatever their cause, such populations are different in fundamental ways. As a society we can either accept and value these differences or assimilate them to a point of their obliteration as differences. At this point I am in agreement with Dobzhansky (1946) when he said that "men are on the first step towards the realization of knowledge - we must however work together for the road is infinite", but believe that the forces of homogeneity are stronger than the maintenance of heterogeneity.

Critique of Jensen's Genetic Theory of I.Q.: A Postscript

Jensen's article in the Harvard Educational Review (1969) begins by stating that the 'compensatory education' in the U.S.A. has failed. Using his statistical data, he attributes the failure of such programs as Head Start to the genetically based low I.Q. of the low SES children. Finding that

significant differences between SES groups occur on tests requiring abstract ability but that no differences occur on memory tasks, Jensen argues that children with a low I.Q. should be educated mainly through memory work. The possibility that differences between SES groups on tests requiring abstract reasoning ability may be attributable to the cultural bias within the test themselves, as the findings of this study suggest, is a factor which Jensen chooses to ignore.

Jensen also neglects to take into account that a small proportion (about 10%) of the compensatory programs did succeed in raising I.Q. scores or scholastic performance. Surely we should try to understand what made these particular programs successful before we give it up altogether. It is conceivable that in many cases the failure to raise the children's I.Q. is not attributable to the children themselves but to the inadequacy of the program. Furthermore, many of the remedial educational programs did not have the aim of boosting I.Q.; yet, because they failed to do so in many cases, Jensen dismisses the value of compensation for a poor environment.

The traditional view of compensatory education programs is that poor or 'deprived' children lack something which, if replaced, will allow them to participate in the mainstream of society. This view seems to involve a tacit assumption that educational innovation is a means of effecting social change; that is, it is through education that the poor will get jobs, or better jobs, and thus break the cycle of poverty. That adherence to this assumption can be purely perfunctory is demonstrated in such cases as the Child Development Group of Mississippi, which showed that if educational (broadly speaking) programs

begin to influence social organization that threaten the status quo, they may be resisted, as indeed this one was, and subsequently further funds were not made available to this group.

If, as psychometry contents, a child's limitations are the results of poor genetic equipment, little can consequently be done in the form of remedial education. These remedial procedures, as Jensen pointed out, have themselves failed and were doomed to failure - if only because they were expected to fail. They were expected to fail because of the children's pattern of learned failure, because of the lack of helpful pedagogic strategy, because of nutritional factors, or because of poor genetic inheritance - to mention only a few of the possible reasons. The genetic factor should therefore be seen as only one of a number of interacting factors in a complex situation. To overstress the genetic constituent is inevitably to assert that the blame belongs on the heads - or, to use a more accurate image in this context, on the lack of heads - of the victims. Jensen's findings, therefore, are extremely useful to the social, political, and educational establishment, which can now salve its conscience with the conclusion that the programs which it tried so hard and so equitably to initiate for 'helping the deprived' were unfortunately doomed from the start by the inherent attributes of the deprived themselves.

One of the difficulties which the empiricist has, of course, is that he deals only in the external attributes of individuals. He cannot concede that intelligence, or indeed any other attribute of an individual, may be understood in terms of the meaning of an individual's environment to him. Empiricists are reducing something as complex and as little understood as the working of the

human brain to a set of mathematical equations. Probably the best example of this phenomenon is expressed by Eysenck (1969), who dismissed those who challenged Jensen's interpretation of a genetic basis for I.Q. as characterized by "an ignorance alike of psychometric techniques of intelligence testing and biometric techniques of genetic analysis. It seems unreasonable to discuss the problem or write about it, when one cannot tell the difference between epistasis and heliotosis, reduce a Hessenberg matrix, or determine and Eigen - value" (p. 4). In the face of such scientific egocentricity one is tempted to assume the attitude of the ever commonsensical Samuel Johnson who, when pushed to frustration with Bishop Berkeley's theory of the unreality of matter, kicked a stone and declared "I refute it thus".

The insensitivity of many psychometricians fails to take any account of the complexities of the real world. Their blind use of I.Q. test data, which on the surface resembles a valid attempt at quantification, leads to conclusions which are not only erroneous but also lack any kind of relationship to reality. For instance, Jensen (1972) reports:

> On the basis of a number of surveys made largely in England, Kushlick concludes that 'mild subnormality in the absence of abnormal neurological signs (epilepsy, electroencephalographic or sensory defects) is virtually confined to the lower social class'. He goes on to say 'there is evidence that almost no children of higher social class parents have I.Q. scores of less than 80, unless they have one of the pathological processes mentioned above'. The same conclusion has been drawn by other investigators and is entirely consistent with the writer's experience gained in conducting studies in schools in lower class and middle class neighbourhoods (p. 209).

Even a cursory acquaintance with the literature of the sociology of plural societies makes it clear that, given the very different relationships to

a social system which minorities might have, it is quite meaningless to compare them as though the only environmental differences between them are those of SES.

It would appear that Jensen has three misconceptions about the word 'environment':

1. That the environment is wholly external and concrete.

2. That environmental variables are discrete entities, the distribution of which across the social status continuum has a linear association to a cognitive hierarchy.

3. The use of a cognitive deficit model of cultural difference.

In conclusion, it seems that if Jensen meant his studies to be scientific, he lacks sufficient controls; if he meant them to be exploratory, he is too dogmatic in his conclusions.

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APPENDIX 1

Making Xs Test

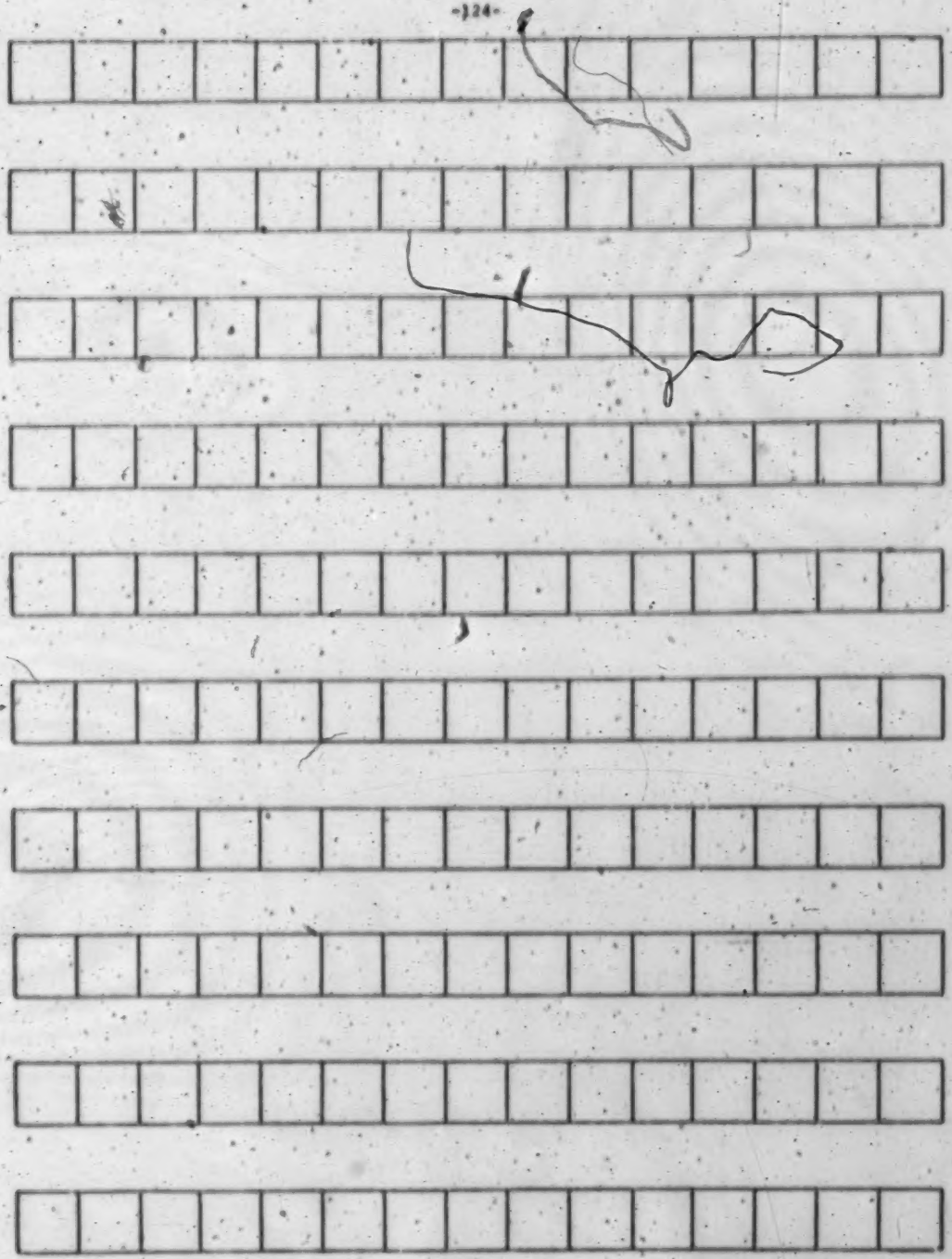
Name _____
Last Name First Name

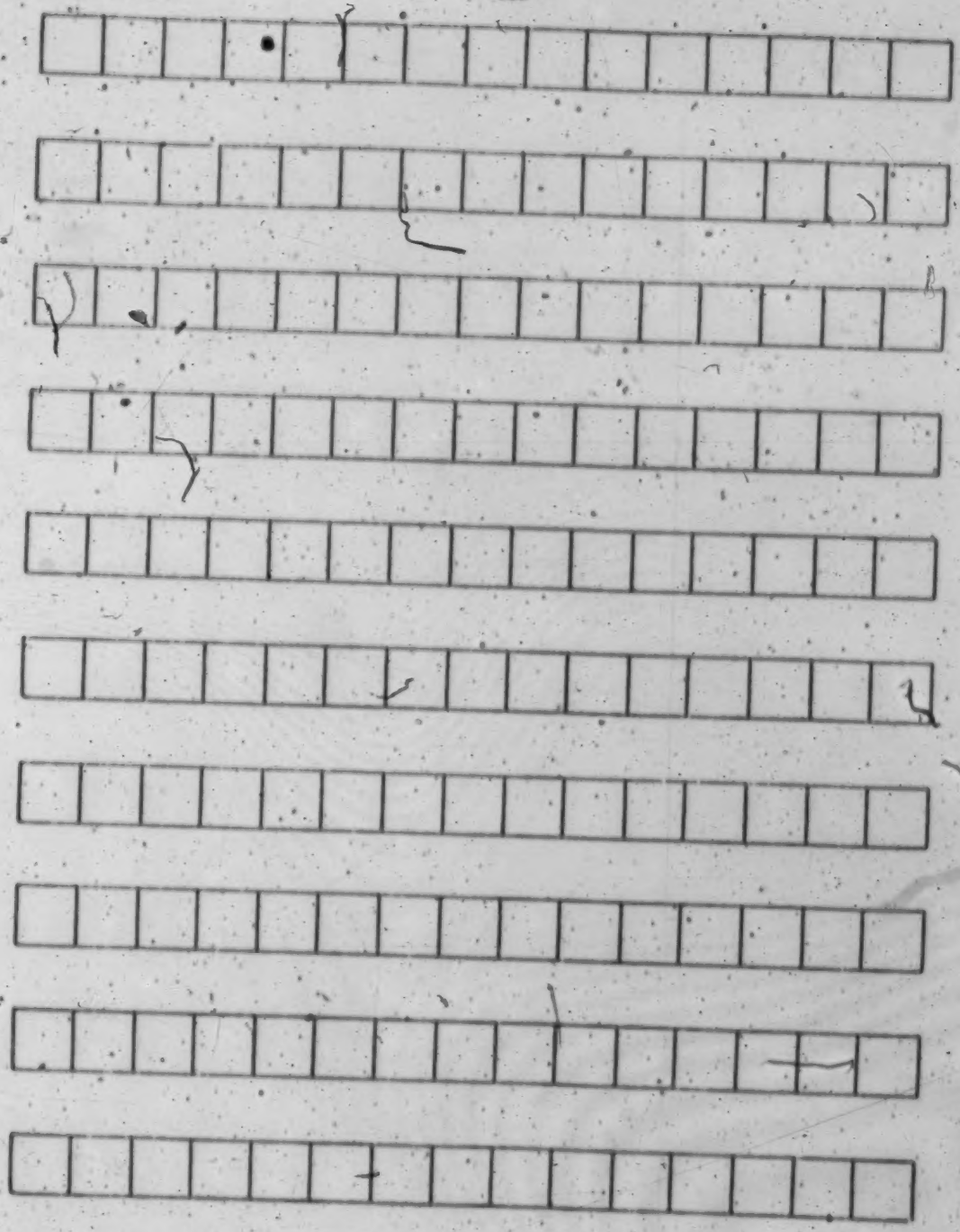
School _____ Grade _____

Teacher _____

Practice Series

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____





APPENDIX 2

THE IAR SCALE

1. If a teacher passes you to the next grade, would it probably be

   a. because she liked you, or
   b. because of the work you did?

2. When you do well on a test at school, is it more likely to be

   a. because you studied for it, or
   b. because the test was especially easy?

3. When you have trouble understanding something in school, is it usually

   a. because the teacher didn't explain it clearly, or
   b. because you didn't listen carefully?

4. When you read a story and can't remember much of it, is it usually

   a. because the story wasn't well written, or
   b. because you weren't interested in the story?

5. Suppose your parents say you are doing well in school. Is this likely to happen

   a. because your school work is good, or
   b. because they are in a good mood?

6. Suppose you did better than usual in a subject at school. Would it probably happen

   a. because you tried harder, or
   b. because someone helped you?

7. When you lost at a game of cards or checkers, does it usually happen

   a. because the other player is good at the game, or
   b. because you don't play well?

8. Suppose a person doesn't think you are very bright or clever

   a. can you make him change his mind if you try to, or
   b. are there some people who will think you're not very bright no matter what you do?

9. If you solve a puzzle quickly, is it

   a. because it wasn't a very hard puzzle, or
   b. because you worked on it carefully?

10. If a boy or girl tells you that you are dumb, is it more likely that they say that

   a. because they are made at you, or
   b. because what you did really wasn't very bright?

11. Suppose you study to become a teacher, scientist, or doctor and you fail. Do you think this would happen

   a. because you didn't work hard enough, or
   b. because you needed some help, and other people didn't give it to you?

12. When you learn something quickly in school, is it usually

   a. because you paid close attention, or
   b. because the teacher explained it clearly?

13. If a teacher says to you "Your work is fine", is it

   a. something teachers usually say to encourage pupils, or
   b. because you did a good job?

14. When you find it hard to work arithmetic or math problems at school, is it

   a. because you didn't study well enough before you tried them, or
   b. because the teacher gave problems that were too hard?

15. When you forget something you heard in class, is it

   a. because the teacher didn't explain it very well, or
   b. because you didn't try very hard to remember?

16. Suppose you weren't sure about the answer to a question your teacher asked you, but your answer turned out to be right. Is it likely to happen

   a. because she wasn't as particular as usual, or
   b. because you gave the best answer you could think of?

17. When you read a story and remember most of it, is it usually

a. because you were interested in the story, or
b. because the story was well written?

18. If your parents tell you you're acting silly and not thinking clearly, is it more likely to be

a. because of something you did, or
b. because they happen to be feeling cranky?

19. When you don't do well on a test at school, is it

a. because the test was especially hard, or
b. because you didn't study for it?

20. When you win at a game of cards or checkers, does it happen

a. because you play really well, or
b. because the other person doesn't play well?

21. If people think you're bright or clever, is it

a. because they happen to like you? or
b. because you usually act that way?

22. If a teacher didn't pass you to the next grade, would it probably be

a. because she "had it in for you", or
b. because your school work wasn't good enough?

23. Suppose you don't do as well as usual in a subject at school. Would this probably happen

a. because you weren't as careful as usual, or
b. because somebody bothered you and kept you from working?

24. If a boy or girl tells you that you are bright, is it usually

a. because you thought up a good idea, or
b. because they like you?

25. Suppose you became a famous teacher, scientist or doctor. Do you think this would happen

a. because other people helped you when you needed it, or
b. because you worked very hard?

26. Suppose your parents say you aren't doing well in your school work. Is this likely to happen more

a. because your work isn't very good, or
b. because they are feeling cranky?

27. Suppose you are showing a friend how to play a game and he has trouble with it. Would that happen

a. because he wasn't able to understand how to play, or
b. because you couldn't explain it well?

28. When you find it easy to work arithmetic or math problems at school, is it usually

a. because the teacher gave you especially easy problems, or
b. because you studied your book well before you tried them?

29. When you remember something you heard in class, is it usually

a. because you tried hard to remember, or
b. because the teacher explained it well?

30. If you can't work a puzzle, is it more likely to happen

a. because you are not especially good at working puzzles, or
b. because the instructions weren't written clearly enough?

31. If your parents tell you that you are bright or clever, is it more likely

a. because they are feeling good, or
b. because of something you did?

32. Suppose you are explaining how to play a game to a friend and he learns quickly. Would that happen more often

a. because you explained it well, or
b. because he was able to understand it?

33. Suppose you're not sure about the answer to a question your teacher asks you and the answer you give turns out to be wrong. Is it likely to happen

a. because she was more particular than usual, or
b. because you answered too quickly?

34. If a teacher says to you "Try to do better", would it be

a. because this is something she might say to get pupils to try harder, or
b. because your work wasn't as good as usual?

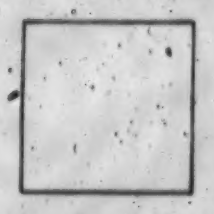
APPENDIX 3

Figure Copying

Ten examples of the designs used are given below.

1

2

3 

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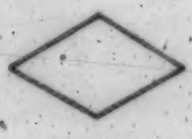
7 

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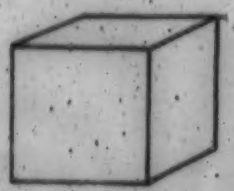
10 

APPENDIX 4

INSTRUCTIONS FOR SHORT TERM MEMORY VISUAL (STMV)

I am going to show you some numbers. I want you to watch the screen and do as I tell you (project slide 1). Look at these numbers, try to remember each number (pause then project blank slide). Now write the numbers you saw on this paper. Good. (If incorrect repeat example 1).

Now, let's try another one (project slide 2). Look at these numbers and try to remember them. (Pause, then project blank slide). Now write the numbers you have just seen. (Repeat until subject understands the instructions and can successfully reproduce the digits).

Set timers.

Now we are going to try again but we will go a bit faster. Ready? (Engage timers (as the first sequence progresses say) look at the numbers ..... write .....).

Let's try another set. Ready (engage timers). Good. Remember to look at the numbers, then write the numbers on the paper.

(Start test with each trial preceded by a ready signal).

APPENDIX 5

INSTRUCTIONS FOR SHORT TERM MEMORY AUDITORY (STMA)

I am going to say some words. When I am finished I want you to say the words just the way I said them. There will be four words in each group. I'll repeat the instructions. I am going to say some groups of words. When I am finished I want you to say the words just the way I said them. Let's try a group of words. Ready? Big, long, great, tall (Pause), you should have said, big, long, great, tall. Each time I say a group of four words, I want you to say the words in exactly the same order that I do. Let's try another group of words. Ready? Cow, day, key, few (Pause), you should have said, cow, day, key, few. Let's try one more list of words. Ready? Man, mad, map, pan (Pause), you should have said, man, mad, map, pan. You see, when I say a group of words, I want you to say the same just as I do. Now let's try another group of words. Ready? (Begin test).

Word lists presented for STMA test:

1.	key	hot	cow	pen
2.	cab	cat	mad	can
3.	day	cow	wall	bar
4.	man	mad	pan	mat
5.	pen	wall	book	key
6.	book	bar	wall	hot
7.	key	few	hot	book
8.	can	pan	tap	cab

9.	tap	mat	pan	cat
10.	key	day	cow	bar
11.	cab	cap	cat	tap
12.	bar	pen	few	day

45 second rest

13.	cab	man	mad	map
14.	mat	can	cap	man
15.	few	pen	hot	wall
16.	day	cow	bar	wall
17.	cap	pan	cat	cab
18.	man	mad	mat	pan
19.	few	day	cow	book
20.	cap	man	mad	tap
21.	key	book	day	hot
22.	cab	tap	man	cat
23.	can	cap	pan	mad
24.	pen	few	wall	cow

APPENDIX 6

ADMINISTRATIVE INSTRUCTIONS FOR THE RAVENS PROGRESSIVE COLOURED MATRICES.

Pencils and record forms are distributed. The people to be tested are asked to fill in particulars about themselves on the record form. When this has been done the test books are given out. They are asked not to open the books until everyone is ready.

The person in charge says: "Open your books to the first page. It is like this". He opens a book or demonstration enlargement for the group to see. "At the top it says Set A and you have a column A here, on your scoring form. This is A.1. You see what it is.. The upper part is a pattern with a bit missing. Each of these bits below (he points to each in turn) is the right shape to fit the space, but they do not all complete the pattern. Number 1 (he points to the bit and then to the pattern) is quite the wrong pattern. Numbers 2 and 3 are wrong - they fit the space, but they are not the right pattern. What about Number 6? It is the right pattern (he illustrates that the pattern is the same as the pattern above) but it does not go all over. Put your finger on the one that is quite right". The person in charge notices if this is done correctly. If necessary he gives further explanation and then says: "Yes, Number 4 is the right one. So the answer to A.1 is 4 - write 4 here, against Number 1 in Column A on your scoring form. Do not turn over yet".

The person in charge waits for everyone to finish and continues: "On every page in your book there is a pattern with a bit missing. You have to

decide each time which of the bits below is the right one to complete the pattern above. When you have found the right bit you write the number of it down on your scoring form against the number of the pattern. They are simple at the beginning and get harder as you go on. There is no catch. If you pay attention to the way the easy ones go you will find the later ones less difficult. Try each in turn, from the beginning right to the end of the book. Work at your own pace. Do not miss any out. Do not turn back. See how many you can get right. You can have as much time as you like. Turn over and do the next one".

When sufficient time has been allowed for everyone to write down the answer to A.2, the person in charge says: "The right one of course is Number 5. See that you have written the figure 5 against Number 2 in Column A on your form. Go on like that by yourselves until you get to the end of the book".

APPENDIX 7

INSTRUCTIONS FOR CROSS-MODAL CODING

I am going to let you listen to some patterns of sounds. Listen carefully. (Examples 1, 2 and 3 without the visual stimulus cards were presented). Each of the patterns you heard are just like the dots you see on this card. (Card shown). Let's take a look at each one. Here is what the first one sounded like. (Example 1 presented). This is what the second one sounded like. (Card 2 shown and example 2 presented). You see. It is just like the dots that are on this card. Let's take a look at the other one that we listened to. (Card 3 shown and example 3 presented). Each pattern you hear is going to be like one of the dot patterns you see here. Let me show you. Listen! (Card 4 shown, example 1 presented). (N.B. Card 4 and all subsequent cards contain three possible sound patterns of which one is correct. Cards 1 to 3 contain only the correct pattern). Which one did you hear? It was this one. (Examiner points to the correct pattern). Listen again, then you show me which one you heard. Ready? (Card 5 shown and example 2 presented). Which one is it? (Subject points). Let's listen to a different one. Ready? (Card 6 shown, example 3 presented). Which one is it this time? Let's try another one. You show me which one you heard. Ready? (Example 1 presented, followed immediately by card 7). Listen again and then show me which one you have heard. (Example 2 presented, then card 8 shown). Ready? (Example 3, then card 9). Ready? (Example 1, then card 10). Ready? (Example 2, then card 11). Ready? (Example 3, then card 12). If

the subject did not correctly identify any of the last three stimuli, the instructions were repeated until he could. Listen carefully and pick out the dots that look like the tones you hear. Ready? (Test item 1 presented, followed by the rest of the test).

APPENDIX B

I.E.R. INTERVIEW SCHEDULE

BACKGROUND

Mother's name: _____

Father's name: _____

Mother's education: _____

Father's education: _____

Source of income: _____

Type of dwelling: _____

Number of children: _____ Boys? _____ Girls? _____

Number of people living in home: _____ Adults: _____ Children _____

QUESTIONS

1. How do you feel about the school progress of your child?

   What marks do you expect him to receive?

   What marks satisfy you?

   Expect: _____ Satisfy: _____

2. How do your other children generally do in school?

3. How much schooling do you wish your child to receive?

4. How much schooling do you expect your child to receive?

5. What is the minimum level of education that you think your child must receive?

6. What kind of work would you like to see your child do when he grows up?

What kind of work would you not like your child to do?

7. How important will education be in achieving the goals you have for your child?

How much importance is education going to have in the life of your child?

Will his future status be radically affected if he does not attain the level of education you wish him to attain?

8. What organizations or clubs, if any, do you belong to? (P.T.A., Church, Political).

Does your child know what you do in these organizations? Yes No

9. What are your favourite recreational pastimes? Your husband's?

What recreational activities do you and your family engage in on weekends together?

What places have you visited on weekends during the past six months?

_____ Why? _____

Mother _____ Father _____ Family _____ Visits _____

Reasons _____

10. How often do you and your husband discuss your child's progress in school?

Very often, Often, Sometimes, Not at all.

What generally results from such discussion?

11. Have you had any experience in teaching? What experience?

Yes _____ No _____

Has your husband had any experience? Yes _____ No _____

12. Have you met your child's present teacher? Yes _____ No _____

If so, when? _____ Why? _____

Does the teacher generally initiate parent-teacher conferences?

Yes _____ No _____

If you ask for a meeting, for what purpose?

13. How does he generally do in school?

What marks does he usually receive?

What are his best subjects? His weakest?

Best _____

Weakest _____

14. What subjects has he improved in the most in the past year?

The least _____

The most _____

15. How often does the school give our report cards?

Do both parents see them? Yes _____ No _____

In what ways do you use the report cards?

16. How often do you ask your child how well he is doing in school?

What in particular do you ask him?

17. Do you know what text books he uses in different subjects in school?

Yes, all _____ Yes, some _____ No _____

18. Do you know your child's best friends in the neighbourhood and at school? Yes _____. No _____

Do you approve of them? Yes _____ No _____

How would you rate these children in their studies?

Do you help your child in choosing his friends? Yes _____ No _____

If so, how?

19. Do you help your child read biographies of great people? Yes _____

No _____. Name _____

Has he read any biographies in the past two months? Yes _____

No _____. Name _____

20. Do you discuss his school marks with him? Yes _____ No _____

What particular things do you discuss with him? _____

21. Do you have plans for your child to go to High School? Yes _____

No _____. If so, what have you done to prepare financially for this? In what other ways, if any, do you prepare him for the attainment of educational goals? (e.g. telling him about colleges, talking to him about what people learn in college, etc.).

22. Have you had to sacrifice any of your major needs or desires such as buying a new car, giving up a job, etc., for the present and/or future education of your child? Yes _____ No _____. If so, what did you give up?

What were the immediate consequences?

1a

PARENTAL ASPIRATIONS FOR THE EDUCATION OF THE CHILD

Criteria:

* Nature of the educational and vocational goals
* Level of expectation of the educational accomplishments

Questions: 1, 2, 3, 4, 5, 6, 7.

Rating Scale:

9	Beyond four years of college. Occupational expectation requiring very high education. Expectation of very high marks, A-plusses, in school.
8	
7	Four years of college. Occupational expectation requiring high education. Expectation of A's with some B's.
6	
5	At least through high school. Some college education desired. Moderately high occupational aspiration. Expectation of B's with some A's and some C's.
4	
3	Only up to high school. Very moderate and uncertain occupational expectation. Expected grades C's with some B's.
2	
1	Absence of any long term educational and vocational goals. Only narrow and immediate goals. No expectations about grades, or expectation below C's.

1b. PARENTS' INTEREST IN ACADEMIC ACHIEVEMENT

Criteria:

* Extent of participation in the educational activities (e.g., reading, PTA)

* Keenness for the educational progress of the child

Questions: 8, 9, 10, 11, 12.

Rating Scale:

9 Both parents active in educational organizations and activities. Very particular about the educational progress of the child.

8

7 Both or any one of the parents active in educational organizations and activities. Particular about the educational progress of the child.

6

5 Only one of the parents occasionally active in educational organizations and activities. Fairly particular about the educational progress of the child.

4

3 Only one of the parents occasionally active in educational organizations and activities. Not quite particular about the educational progress of the child.

2

1 None of the parents active in any educational organization or activity. Not at all particular about the educational progress of the child.

1c. KNOWLEDGE OF THE EDUCATIONAL PROGRESS OF THE CHILD

Criteria:

* Extent of knowledge of the child's educational progress
* Extent of knowledge of the textbooks used by the child and his courses of study.

Questions: 13, 14, 15, 16, 17.

Rating Scale:

9 Detailed and up-to-date knowledge about the daily progress of the child in the school. Knowledge about the specific topics being studied or recently completed by the child in different subjects. Good acquaintance with all the textbooks used by the child.

8

7 Detailed knowledge about the daily progress of the child in the school. Knowledge about the general topics covered or being covered. Acquaintance with some of the textbooks.

6

5 General idea about the child's progress in terms of subject-wise grades. Knowledge of the general topics covered in some of the subjects. Acquaintance with one or two textbooks.

4

3 Some gross idea about the child's school progress in terms of general grades. Knowledge of the subjects studied but not the topics. No acquaintance with textbooks.

2

1 No knowledge of the child's school progress. No knowledge of the textbooks or topics of study.

Id. PREPARATION AND PLANNING FOR THE ATTAINMENT OF EDUCATIONAL GOALS

Criteria:

* Financial preparation
* Academic and mental preparation (e.g., emphasizing good grades as preparation for higher learning, selecting bright children as friends)

Questions: 13, 18, 19, 20, 21, 22

Rating Scale:

9	Sound financial preparation. Also academic and mental preparation for higher learning.
8	
7	A good financial preparation, or achievement of best grades in the hope of getting good scholarships for higher learning. Also fairly good academic and mental preparation for higher learning.
6	
5	Moderate financial preparation, or a desire to do it but not yet done. Some efforts toward academic and mental preparation for higher learning.
4	
3	Only incidental preparation. No definite plans made yet. Moderately high educational goals. However, the parents are aware of the need for doing financial and other preparation to reach the goals.
2	
1	No financial or other preparation. Absence of any higher educational goals.

APPENDIX 9

INSTRUCTIONS FOR THE I-E SCALE

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered a or b. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you are concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief: obviously there are no right or wrong answers.

In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you are concerned. Also try to respond to each item independently when making your choice; do not be influenced by your previous choices.

1. a. Children get into trouble because their parents punish them too much.

   b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.

   b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.

   b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.

   b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

5. a. The idea that teachers are unfair to students is nonsense.

   b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6. a. Without the right breaks one cannot be an effective leader.

   b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. a. No matter how hard you try some people just don't like you.

   b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality.
   b. It is one's experience in life which determine what they're like.

9. a. I have often found that what is going to happen will happen.
   b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well prepared student, there is rarely if ever such a thing as an unfair test.
    b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
    b. This world is run by the few people in power, and there is not much the little guy can do about it.

13. a. When I make plans, I am almost certain that I can make them work.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.
    b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
    b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.

b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.

b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.

b. There really is no such thing as "luck".

19. a. One should always be willing to admit mistakes.

b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.

b. How many friends you have depends upon how nice a person you are.

21. a. In the long run the bad things that happen to us are balanced by the good ones.

b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.

b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.

b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.

b. A good leader makes it clear to everybody what their jobs are.

25. a. Many times I feel that I have little influence over the things that happen to me.

b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.

b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.

b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.

b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.

b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX I'O

Table 1: Occupations ranked and grouped according to combined standard scores for income and years of schooling, by sex, Canada, 1951*

Occupation	Sex	Score†	Occupation	Sex	Score†
Class 1			Manufacturing managers	M	63.0
Judges	M	90.0	Community service workers	M	62.4
Dentists	M	82.5	Social welfare workers	F	62.2
Physicians and surgeons	M	81.2	Osteopaths and chiropractors	F	62.2
Lawyers	M	78.8	School teachers	M	62.2
Engineers, chemical	M	77.8	Librarians	M	62.0
Actuaries	M	77.6	Accountants and auditors	M	61.8
Engineers, mining	M	77.4	Authors, editors, and journalists	F	61.4
Engineers, electrical	M	75.2	Clergymen	M	61.0
Engineers, civil	M	75.0	Designers, clothing	M	60.6
Architects	M	73.2	Govt. service officials	M	60.6
Class 2			Transportation managers	M	60.1
Statisticians	F	72.9	Farmers	F	59.4
Engineers, mechanical	M	72.6	Community service workers	F	59.1
Professors	M	72.0	Dispatchers, train	M	58.5
Stock and bond brokers	M	70.9	Designers, cloth	F	58.2
Veterinarians	M	69.8	Insurance agents	M	58.2
Business service officers	M	69.5	Foremen, communication	M	58.1
Statisticians	M	68.8	Advertising agents	M	58.0
Mining managers	M	67.9	Managers n.e.s.†	M	57.7
Finance managers	M	67.7	School teachers	F	57.6
Osteopaths and chiropractors	M	67.3	Artists and teachers of art	M	57.6
Dietitians	F	67.0	Nurses, graduate	F	57.4
Professors	F	66.7	Real-estate agents and dealers	M	57.0
Chemists and metallurgists	M	65.8	Social welfare workers	M	57.0
Officers, armed forces	M	65.1	Retail trade managers	M	57.0
Air pilots	M	65.0	**Class 3**		
Chemists and metallurgists	F	64.8	Actors	F	56.9
Agricultural professionals	M	64.8	Commercial travellers	M	56.7
Electricity, gas, and water officials	M	64.7	Advertising agents	F	56.6
Other professions	M	64.0	Forestry managers	M	56.5
Construction managers	M	63.8	Artists, commercial	F	56.4
Wholesale trade managers	M	63.5	Radio announcers	M	56.4
Librarians	F	63.4	Laboratory technicians n.e.s.†	F	56.0
Authors, editors, and journalists	M	63.4	Artists, commercial	M	56.0

Occupation	Sex	Score†
Class 3 (continued)		
Draughtsmen	M	58.0
Brokers, agents, and appraisers	M	56.9
Inspectors, communication	M	55.0
Artists and teachers of art	F	55.0
Surveyors	M	55.0
Recreation service officers	M	54.8
Purchasing agents	M	54.8
Agents, ticket station	M	54.8
Laboratory technicians n.e.s.‡	M	54.5
Stenographers and typists	F	54.1
Conductors, railway	M	54.1
Radio operators	M	54.0
Locomotive engineers	M	54.0
Photo-engravers	M	54.0
Music teachers	M	53.7
Teachers n.e.s.‡	F	53.6
Office appliance operators	F	53.4
Teachers n.e.s.‡	M	53.4
Retail trade managers	F	53.3
Telegraph operators	F	52.9
Foremen, mining	M	52.8
Window-decorators	F	52.5
Nurses, graduate	M	52.2
Actors	M	52.1
Stenographers	M	52.0
Class 4		
Book-keepers and cashiers	F	51.9
Forewomen, communication	F	51.8
Foremen, manufacturing	M	51.8
Photographers	M	51.8
Inspectors, construction	M	51.7
Window-decorators	M	51.6
Telegraph operators	M	51.6
Petroleum refiners	M	51.6
Toolmakers	M	51.6
Engravers, except photo-engravers	M	51.4
Undertakers	M	51.3
Office clerks	F	51.2
Locomotive firemen	M	51.2
Book-keepers and cashiers	M	51.2
Brakemen, railway	M	51.1
Power-station operators	M	51.0
Office-appliance operators	M	51.0
Doctor, dentist attendants	F	50.8
Motion-picture projectionists	M	50.8
Radio repairmen	M	50.8
Captains, mates, pilots	M	50.7
Foremen, transportation	M	50.7
Foremen, commercial	M	50.6
Personal service officers	M	50.5
Class 5		
Patternmakers	M	50.4
Compositors	M	50.4
Inspectors, metal	M	50.4
Paper-makers	M	50.4
Photographers	F	50.2
Policemen	M	50.2
Office clerks	M	50.2
Mechanics, airplane	M	50.1
Inspectors, metal products	F	50.0
Music teachers	F	50.0
Firemen, fire department	M	49.8
Pressmen and plate printers	M	49.8
Telephone operators	F	49.6
Electricians	M	49.6
Machinists, metal	M	49.6
Linemen and servicemen	M	49.4
Engineering officers (on ships)	M	49.4
Baggagemen	M	49.4
Transportation inspectors	M	49.4
Rolling-mill men	M	49.4
Auctioneers	M	49.3
Inspectors and graders	M	49.2
Farmers	M	49.2
Photographic occupations n.e.s.‡	M	49.2
Collectors	M	49.1
Dental-mechanics	M	49.1
Sulphite cookers	M	49.0
Assemblers, electrical equipment	F	48.9
Operators, electric street-railway	M	48.8

Occupation	Sex	Score†	Occupation	Sex	Score†
Class 5 (continued)			Plumbers	M	40.8
Stationary engineers	M	48.7	Motormen	M	40.7
Bookbinders	M	48.0	Quarriers	M	40.6
Tire- and tube-builders	F	48.4	Machine operators, metal	M	40.5
Canvassers	M	48.2	Paint-makers	M	40.4
Telephone operators	M	48.2	Filers	M	40.4
Switchmen and signalmen	M	48.2	Upholsterers	M	40.3
Opticians	M	48.2	Knitters	M	40.3
Jewellers and watch-makers	M	48.2	Wood-inspectors	M	40.3
Personal service workers	F	48.1	Barbers	F	40.2
Assemblers, electrical-equipment	M	48.1	Milliners	F	40.2
Tire- and tube-builders	M	48.1	Tobacco products workers	F	40.2
Millwrights	M	48.0	Furnacemen	M	40.2
Religious workers n.e.s.†	M	48.0	Furriers	M	40.2
Fitters, metal	F	47.9	Brothers	M	40.1
Milliners	M	47.8	Paper-box makers	M	40.1
Construction foremen	M	47.7	Other bookbinding workers n.e.s.†	F	40.0
Opticians	F	47.6	Coremakers	M	40.0
Bus-drivers	M	47.0	Vulcanizers	M	40.0
Heat-treaters	M	47.0	Liquor and beverage workers	M	40.0
Religious workers n.e.s.†	F	47.5	Postmen	M	39.9
Photographic workers n.e.s.†	F	47.4	Meat-canners	F	39.9
Machine operators, metal	F	47.4	Other upholstering workers n.e.s.†	F	39.8
Boilermakers	M	47.3	Bookbinders	F	39.8
Jewellers and watch-makers	F	47.2	Transportation, storage, communication workers	F	39.8
Other bookbinding workers n.e.s.†	M	47.2	Polishers, metal	M	39.8
Sales clerks	M	47.2	Furriers	F	39.6
Hoistmen, craanemen	M	47.2	Structural iron workers	M	39.6
Welders	M	47.2	Mechanics, motor	M	39.6
Mechanics n.e.s.†	M	47.2	Textile inspectors	M	39.6
Mechanics, railroad	M	47.2	Cabinet- and furniture-makers	M	39.5
Fitters, metal	M	47.2	Loom-fixers	M	39.5
Cutters, textile-goods	M	47.2	Weavers, textile	F	39.4
Millmen	M	47.2	Butchers	M	39.4
Wire-drawers	F	47.1	Logging foremen	M	39.4
Coremakers	F	47.1	Miners	M	39.4
Riggers	M	47.1	Labellers	M	39.3
Sheetmetal workers	M	47.1	Nurses, in training	F	39.3
Shipping clerks	M	47.0	Meat-canners	M	39.2
Wire-drawers	M	40.9	Farm managers	M	39.2
Other ranks, armed forces	M	40.8	Plasterers	M	39.2
Electroplaters	M	40.8			

Occupation	Sex	Score†
Class 5 (continued)		
Textile inspectors	M	45.1
Other pulp-and-paper workers	F	45.1
Class 6		
Winders and warpers	F	45.0
Carders and drawing-frame workers	F	45.0
Sales clerks	F	45.0
Moulders, metal	M	45.0
Nurses, practical	M	45.0
Cutters, textile-goods	F	44.9
Elevator-tenders	F	44.8
Tailoresses	F	44.8
Textile inspectors	M	44.8
Potmen	M	44.8
Timbermen	M	44.7
Prospectors	M	44.7
Oilers, power-plant	M	44.7
Liquor and beverage workers	F	44.6
Paper-box makers	F	44.6
Kiln burners	M	44.6
Brick and stone masons	M	44.6
Construction-machine operators	M	44.5
Canvassers	F	44.4
Service-station attendants	M	44.4
Painters and decorators	M	44.4
Hat- and cap-makers	M	44.4
Bleachers and dyers	M	44.4
Spinners and twisters	F	44.3
Rubber shoe makers	F	44.3
Porters	M	44.3
Tobacco products workers	M	44.2
Millers	M	44.2
Nurses, practical	F	44.1
Finishers, textile	F	44.0
Blacksmiths	M	44.0
Tailors	M	44.0
Bakers	M	43.8
Weavers	M	43.8
Rubber shoe makers	M	43.8
Labellers	F	43.7
Barbers	M	43.6
Other personal service workers	F	43.6
Truck drivers	M	43.6
Packers and wrappers	M	43.6
Finishers, wood	M	43.6
Finishers, textile	M	43.6
Tanners	M	43.6
Hat- and cap-makers	F	43.5
Cutters, leather	M	43.5
Commercial packers and wrappers	F	43.4
Teamsters	M	43.4
Stone-cutters	M	43.4
Riveters and rivet-heaters	M	43.4
Butter and cheese makers	M	43.3
Chauffeurs	M	43.3
Boiler firemen	M	43.3
Spinners	M	43.3
Inspectors n.e.s., graders†	F	43.2
Postmen	F	43.2
Waiters	M	43.2
Carpenters	M	43.2
Sewers and sewing-machine operators	M	43.2
Forest rangers	M	43.2
Lock-keepers, canalmen	M	43.1
Wood turners	M	43.1
Labourers, mines and quarries	M	43.1
Sewers and sewing-machine operators	F	43.0
Brick and stone masons	F	43.0
Textile inspectors	F	42.8
Machine operators, boot and shoe	F	42.8
Knitters	F	42.8
Guards	M	42.8
Winders, warpers, pirlers	M	42.8
Glovemakers	M	42.7
Cutters, leather	F	42.6
Elevator-tenders	M	42.5
Bakers	F	42.4
Machine operators, boot and shoe	M	42.4
Launderers	M	42.4

Occupation	Sex	Score†	Occupation	Sex	Score†
Class 6 (continued)			Waitresses	F	41.2
Firemen, on ships	M	42.4	Glovemakers	F	41.2
Cement and concrete finishers	M	42.4	Labourers	M	40.8
Dressmakers and seamstresses	F	42.3	Cooks	F	40.5
Carders and drawing-frame tenders	M	42.3	Messengers	M	40.5
Box and basket makers	F	42.2	Shoemakers	M	40.2
Coopers	M	42.2	Ushers	M	40.1
Sailors	M	42.1	Janitors	F	40.0
Harness and saddle makers	M	42.0	Hawkers	M	39.3
Nurse	F	41.8	Housekeepers and matrons	F	38.9
Class 7			Hotel café and household workers	M	38.8
Cooks	M	41.8	Newsboys	M	38.7
Janitors	M	41.6	Guides	M	37.8
Laundresses, cleaners, and dyers	F	41.4	Hotel café and household workers	F	37.8
Sectionmen and trackmen	M	41.4	Farm labourers	M	37.5
Charworkers and cleaners	M	41.3	Lumbermen	M	37.4
Paper-box, bag, and envelope makers	M	41.3	Charworkers and cleaners	F	37.4
Sawyers —	M	41.2	Fishermen	M	36.9
Longshoremen	M	41.2	Bootblacks	M	36.8
			Fish canners, curers and packers	M	36.8
			Fish canners, curers and packers	F	36.0
			Hunters and trappers	M	35.6

* Canada, Dominion Bureau of Statistics, *Census of Canada, 1931*, V, Table 21, and IV, Table 11 (Ottawa, 1933); Canada, Dept. of Internal Revenue, *Taxation Statistics, 1931* (Ottawa, 1933). Additional information supplied by D.B.S., Census Analysis Section.

† The mean of the scores = 50, the standard deviation = 10 (calculated separately for each sex).

‡ n.e.s. = not elsewhere specified.

Table 2: Percentage distribution of labour force,* occupational classes, selected origins, Canada, 1951

Occupational class	Origin												
	Total	British	French	German†	Italian	Scandinavian	Russian	Ukrainian	Polish	Other European	Jewish	Native Indian and Eskimo	Asiatic
	(a) Percentage distribution of occupational classes, by origin												
Class 1	100.0	66.3	18.7	2.3	0.6	1.4	0.6	1.1	1.0	3.1	4.4	—	0.5
Class 2	100.0	54.0	26.2	4.1	1.0	2.0	0.7	1.8	1.1	3.7	4.7	—	0.7
Class 3	100.0	64.5	19.4	3.2	1.1	1.8	0.5	2.0	1.2	3.5	2.3	—	0.5
Class 4	100.0	59.6	22.8	3.5	1.3	1.7	0.5	2.1	1.3	4.1	1.9	—	1.2
Class 5	100.0	51.8	26.5	5.4	1.1	2.6	0.7	3.7	2.0	5.1	0.7	0.1	0.3
Class 6	100.0	42.2	36.8	4.2	2.0	1.9	0.7	2.9	2.1	4.8	1.4	0.2	0.8
Class 7	100.0	38.7	35.0	5.3	1.7	2.4	0.9	4.4	2.6	6.8	0.3	0.8	1.1
Total	100.0	49.0	29.5	4.7	1.4	2.2	0.7	3.2	1.9	5.1	1.4	0.2	0.7
	(b) Percentage distribution of origins, by occupational class												
Class 1	0.9	1.3	0.6	0.5	0.4	0.6	0.9	0.3	0.5	0.6	2.9	—	0.7
Class 2	10.7	11.8	9.5	9.3	7.8	9.6	9.8	6.1	6.2	7.8	35.7	1.4	10.8
Class 3	6.3	8.3	4.1	4.3	5.1	5.2	4.7	3.9	4.0	4.3	14.1	0.9	4.5
Class 4	7.0	8.5	5.4	5.2	6.4	5.3	4.9	4.6	4.7	5.8	9.5	1.2	12.1
Class 5	34.2	36.2	30.6	39.4	26.4	39.3	33.7	33.7	35.3	34.3	18.0	12.0	15.2
Class 6	19.6	17.0	24.5	17.3	28.2	16.9	18.4	17.5	21.0	18.7	20.0	12.8	23.0
Class 7	21.3	16.9	25.3	24.0	25.7	23.1	27.6	28.9	26.3	23.5	5.8	71.8	33.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* D.B.S., *Census of Canada, 1951*, IV, Table 12.

† Austrian included with "other European".